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Ruby A Federal No. 1-9 exploratory oil/gas well

RECORD OF DECISION AND FINAL ENVIRONMENTAL IMPACT STATEMENT

Ruby A Federal No. 1-9 Exploratory Oil/Gas Well

Proposed Oil and Gas Drilling Near Red Lodge, Carbon County, Montana

Department of Agriculture
Forest Service
Custer National Forest

Department of the Interior
Bureau of Land Management
Miles City District

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RECORD OF DECISION

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Miles City District

Gary Holsan Environmental Planning

February 22, 1990

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RESPONSIBLE OFFICIALS

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RECORD OF DECISION

RUBY A FEDERAL NO 1-9
EXPLORATORY OIL/GAS WELL

CARBON COUNTY, MONTANA

FINAL ENVIRONMENTAL IMPACT STATEMENT

USDA FOREST SERVICE, CUSTER NATIONAL FOREST, BEARTOOTH RANGER DISTRICT

USDI BUREAU OF LAND MANAGEMENT, MILES CITY DISTRICT

I. INTRODUCTION

On January 21, 1988, Phillips Petroleum Company (Phillips) filed an Application for Permit to Drill (APD), which includes the Surface Use Plan of Operations and Drilling Plan, with the Bureau of Land Management (BLM) to drill an exploratory oil/gas well. This proposed drill site was located on the north end of what is commonly referred to as the Line Creek Plateau. Approximately 12 miles of access route was proposed to reach the drill site from the Beartooth Highway (U.S. Highway 212). Public scoping was conducted during March and April of 1988 to solicit public comments on the proposed action. Due to the sensitivity of the alpine environment of the Line Creek Plateau, substantial public opposition, and re-evaluation of the seismic data, Phillips withdrew its original proposal for drilling on the plateau on July 5, 1988. On August 3, 1988, Phillips filed a revised APD for directionally drilling at the proposed location on the east side of the Line Creek Plateau. This revised location is in the northwest quarter of Section 15, T9S, R20E, Montana Principle Meridian (MPM). Disturbance associated with the proposed action alternative would include 21.3 acres of existing road reconstruction, 1.5 acres of new road construction, a 1.7 acre drill pad, and 0.8 acres of cut and fill slopes and topsoil stockpile associated with the drill site. Total disturbance would be 25.3 acres.

The revised APD submitted to the BLM and Forest Service, was discussed at a public meeting conducted by Phillips, and news releases were made to the local news media to inform the public of changes in the drilling proposal and to identify the environmental issues and concerns associated with the revised APD proposal. Based upon the environmental issues identified during the public involvement process, the Forest Service and the BLM determined that the Phillips proposal may significantly affect the human environment and that an Environmental Impact Statement (EIS) would be required. The EIS analysis process for the revised drilling proposal commenced in September, 1988.

The Draft Environmental Impact Statement (DEIS) was released May 26, 1989. After a public review period lasting until July 10, 1989, a Final Environmental Impact Statement (FEIS) has been prepared. The FEIS describes the effects of three action alternatives for the drill sites and five alternatives for access. The FEIS also analyzes a No Action Alternative. The FEIS discloses the effects of the alternatives considered and provides the basis for the decisions made on drill site and access route.

The FEIS disclosed the environmental effects of all alternatives considered in detail. Some environmental effects of all of the action alternatives would be similar. These similar effects are on cultural resources, health and safety, socio-economics, air quality, and water. For a more detailed discussion of environmental effects of each of the alternative, see the FEIS, Chapter 4.

Subject to valid, pre-existing rights, the National Forest System land within the project area is currently managed according to direction in the Custer National Forest Land Management Plan

(FEIS, 1987). An examination of the Custer National Forest Land Management Plan disclosed no inconsistencies between land allocations in that plan, and the activities associated with the selected alternatives. The FEIS for the Ruby A Federal No. 1-9 Well, therefore, tiers to the Custer National Forest Plan and associated EIS. (See FEIS, Chapter 1, Section 1.5 Land Status, Legal, and Policy Considerations.)

II. DECISION

A. Forest Service Decisions made by the Forest Supervisor under the authority of the Federal Onshore Oil and Gas Leasing Reform Act:

Based on the Ruby A Federal No. 1-9 oil/gas well FEIS and the associated documents that the FEIS is tiered to, or incorporated by reference, it is my decision to select drilling location Alternative A (Ruby Creek) and to approve the Surface Use Plan of Operations, which includes the selection of that portion of access variation A2 which involves National Forest System lands. The specific mitigation requirements that are made part of this decision remain the same as outlined in Chapter 5 of the FEIS except as discussed below related to the operational period and the location of the drilling rig during the non-operational period.

With respect to the operational period, it is my decision to approve operations during the general time period of June 15 to October 15. The October 15 date may be modified based on actual conditions in the following cases:

1. In the event of abnormal climatic conditions, such as early snows, drought, or fire, that could lead to some significant impacts to elk, Phillips may be required to cease drilling operations prior to October 15.

2. If the climatic conditions identified in item 1 are not a factor and terminating drilling operations on October 15 will jeopardize completion of the project within two drilling periods, Phillips may be authorized to drill up to November 15. In any case, Phillips must have any drilling and casing completed (i.e. the well placed in a safe condition) and cease operations by November 15.

In order to assess the eventualities identified in items 1 and 2 above, a part of my decision is that the Forest Service, BLM, Phillips, and the Montana Department of Fish, Wildlife and Parks will meet shortly after September 1, 1990 to jointly assess the situation. If necessary, additional meetings will be held to further assess any changes in the situation over time. In any event, Phillips will be given sufficient time to cease all operations and put the well in a safe condition.

I have also decided to allow Phillips to leave the drill rig on site during the non-operational period (October 16 to June 14). However, if Phillips chooses to remove the drill rig, it must be done by the date agreed to for cessation of operational activities in the fall, generally October 15.

My decision includes adopting a monitoring plan and approving the surface use related portions of the Contingency and Evacuation Plan included in the FEIS in Chapter 5 and Appendix E, respectively. The monitoring plan provides information to evaluate project objectives and effects. Information gathered through monitoring will also be used to evaluate the appropriateness of the mitigation measures and success of rehabilitation measures. The Contingency and Evacuation Plan details procedures to be followed in case of an H_2S emergency.

It should be noted that the effects I based my decision on were for a two year drilling period. Should the drilling of the well not be completed within a two year period, an additional analysis will be required prior to making a decision as to whether or not to grant an extension.

The reclamation plan (FEIS, Appendix D) will guide the reclamation of any disturbed areas and will be implemented in a timely manner.

B. Bureau of Land Management Decisions made by the District Manager:

It is my decision to approve the Application for Permit to Drill which includes the Drilling Plan, the Contingency and Evacuation Plan, and the Surface Use Plan of Operations approved by the Forest Service.

It is also my decision to select access Alternative A2 (Meeteetse Trail - Robinson Draw). Road construction activities on BLM surface will require a Right-of-Way grant which will specify construction standards and the operational period. The grant issuance will be consistent with the FEIS.

III. PUBLIC INVOLVEMENT CONDUCTED

The Forest Service and BLM conducted internal and public scoping of issues which included review of the Custer National Forest Plan and contacts with the various agencies and publics identified in the FEIS (Chapter 6).

A. Issues Identified

The major issues identified during scoping form the basis for formulating and evaluating alternatives for the proposed project. This section briefly describes the issues and compares the alternatives on each major issue. (See FEIS, Chapter 1 for more discussion of the issues. Refer to FEIS, Chapter 4 for comparison of the environmental effects of the alternatives.)

Issue No. 1: Concern for scenic and wildlife resources important to the tourist based economy of Red Lodge Montana, and concern over possible subsequent field development.

Discussion: Scenic and wildlife values within the project area will be affected to differing degrees by the various alternatives. The Ruby Creek drill site occupies a saddle within important elk habitat. The area of the saddle, the proposed drill site location, is also an important elk migration route. The Gold Creek drill site is on the edge of the main winter range and does not have the potential for impacting wildlife to the same degree as the Ruby Creek site. The Ruby Creek drill site variation (Alternative A variation), while within the main winter range area is lower in elevation and located on a small alluvial fan. Hence, the impacts to elk would be somewhat less than the Ruby Creek site but greater than the Gold Creek site. Impacts to other wildlife species would be minor.

The issue of concern for wildlife is mitigated to the point where impacts are judged to be non-significant through the establishment of an operating season of June 15 to October 15 and limiting all project related activities on National Forest system lands to two drilling seasons.

The impacts to visual quality are judged to be greatest from the Gold Creek site as opposed to the other drill site alternatives. The Ruby Creek drill site variation (Alternative A variation) would have the least impact to visual quality due to its lower elevation. Some impacts to visual quality could be mitigated by removing the well rig during the non-drilling period. However, this could affect the overall reclamation of disturbed areas (see also Issue 8).

NEPA requires that an environmental analysis consider the direct, indirect, and cumulative effects of the proposed action and those actions judged reasonably foreseeable. Appendix B discusses a reasonably foreseeable development scenario in the event the proposed well is productive. However, the decision in this ROD only authorizes the drilling, testing, and access

construction associated with this well. Further NEPA analysis will be required prior to authorizing or denying future development.

Issue No. 2: Dispersed recreation values within the project area, primarily big game hunting, could be reduced as a result of drilling activities.

Discussion: The adverse impacts to recreation, primarily fall hunting, would be minor except during the big game rifle season. The magnitude of the adverse effects would be smaller under Alternative B, the Gold Creek site. This is due to the slightly lower hunting activity reported for that portion of the project area.

The impacts to dispersed recreation (hunting) can be mitigated with the approved operational period of June 15 to October 15, which would be the same under any of the alternatives.

Issue No. 3: There is concern regarding possible adverse impacts to the biological, physical, and aesthetic values of the Greater Yellowstone Ecosystem resulting from the drilling proposal.

Discussion: The impacts within the Greater Yellowstone Area are judged to be virtually the same with each of the alternative drill site locations and access variations since each alternative is located in the same general location. Mitigation measures outlined in Chapter 5 would reduce these overall effects to a level of non-significance. The cumulative impacts associated with possible future development are discussed in the FEIS, Appendix B.

Issue No. 4: New road construction would be required to access the proposed drill site on lands currently managed by the Custer National Forest in a road closure area.

Discussion: There would be some new road construction to access each drill site alternative. The selected Ruby Creek site would require approximately 0.3 miles of new road construction on National Forest system lands within Management Area C. (See FEIS, Chapter 1 for a discussion of the management goals of this area). The Gold Creek alternative site would require approximately 0.5 miles of new road construction within Management Area C. In all alternatives, new road constructed within Management Area C would be closed to public use. This ROD does not make a decision on long-term use of any new roads in regards to production or further development.

Issue No. 5: There are concerns regarding the cumulative effects of this drilling action on big game habitat (primarily elk) when considered with on-going activities in the vicinity of the drilling proposal.

Discussion: As disclosed in the FEIS, the cumulative effects to big game habitat would be less in Alternative B (Gold Creek Drill Site) as opposed to either the selected Ruby Creek site or the site proposed in the Ruby Creek variation alternative. This is because the Gold Creek site is near the border of the winter range area. The overall cumulative effects of the various alternative drill sites and access routes are discussed in Chapter 4. The cumulative impacts that could be associated with future oil and gas developments within the area are discussed in Appendix B, FEIS.

Issue No. 6: There is an annual elk migration through the project area. The drilling proposal may disrupt use of historic migration routes.

Discussion: Reference the discussion of issue resolution presented for Issue 1 above.

Issue No. 7: There are management concerns regarding possible impacts on big game spring, fall, and winter range in portions of the leasehold.

Discussion: Reference the discussion of issue resolution presented for Issue 1 above.

Issue No. 8: Concerns exist regarding successful road reclamation on steep slopes in the vicinity of the drill site.

Discussion: Under Alternative A, the Ruby Creek drill site, approximately 0.15 miles of standard road construction and 0.15 miles of bench cut and end haul construction across a 50-60 percent side slope would be required. This special construction technique would not be required in the other alternative drill site locations. Bench cut and end haul road construction for Alternative A is preferable to standard side-case construction because side-case construction would disturb a larger area and make reclamation more difficult. Road cut stabilization and final reclamation are feasible.

Issue No. 9: Concerns exist for the cumulative impacts of the drilling proposal relative to other land and resource use activities in the area.

Discussion: Reference the discussion on issue resolution for Issue 5 above.

Issue No. 10: Hydrogen sulfide (H_2S) gas could be encountered during the drilling operation. There are concerns for the safety of the drilling crew and the public (primarily recreationists) in the vicinity of the drilling operation.

Discussion: There is a possibility of encountering H_2S in the Phosphoria, Tensleep, and Madison Formations. The possibility of encountering H_2S is judged to be the same in all alternatives. The possibility of exposure to H_2S is judged to be greatest with the Ruby Creek and Ruby Creek variation drill site alternatives due to the location of a summer residence directly down drainage and within one mile.

An H_2S Contingency Plan that addresses the accidental release of H_2S during drilling has been prepared to safeguard the lives of the public and company personnel in the event of equipment failures. (See FEIS, Appendix E).

B. Summary of Public Involvement and Comments

Because of the importance of the area as big game habitat, the Forest Service recognized that the project proposal would intensify debate about the most appropriate uses for the area. A priority of the Forest Service has been to involve the public in the decision making process. The Forest Service encouraged public involvement through public scoping meetings, and in addition to these public meetings, field tours were conducted and a Phillips Well Task Force was formed representing the major issues for the project.

The DEIS for the Ruby A Federal No. 1-9 Exploratory Oil/Gas Well was released on May 26, 1989. The public review period lasted until July 10, 1989. Thirty-four individual responses were received on the DEIS. Each respondent commented on one or more specific topics.

Most of the respondents expressed the conviction that the proposed project would have a significant adverse affect on big game habitat. Other commentors expressed the concern that the project was inconsistent with the long standing management objectives for the area and the management direction for the area as outlined by the Custer National Forest Plan.

One significant comment expressed by the Greater Yellowstone Coalition revolved around another alternative drill site location. This alternative was analyzed and carried through the complete analysis in the FEIS.

RECORD OF DECISION

The EIS was revised to reflect the comments received from the public and other agencies. Changes made between the draft and final stages of the EIS are shown in italics in the FEIS.

(For more information on public comments on the DEIS and the Forest Service response to these comments, see FEIS, Chapter 6 and Appendix H).

IV. ALTERNATIVES

Following public scoping of the environmental issues and field reconnaissance, the process of alternative development began. Based on the identified issues and management concerns, a range of reasonable alternatives for the project was developed, analyzed, and documented in the DEIS. During the public comment period on the DEIS, another alternative drill site was identified by representatives of the Greater Yellowstone Coalition (Ruby Creek Alternative A Variation). This alternative drill site was reviewed on the ground by the Forest Service, BLM, and Phillips. After this review, it was determined this alternative site was a viable alternative and should be analyzed prior to the preparation of the FEIS.

The FEIS discusses the effects associated with the No Action Alternative, three alternative drill sites, and five alternatives for access to the project area. These alternatives are briefly described below. (For a more complete discussion of alternative development, see FEIS, Chapter 2).

No Action Alternative (Environmentally Preferred)

The No Action Alternative is required by the National Environmental Policy Act and serves as a baseline for comparing other alternatives. Under this alternative the proposed well would not be drilled and there would be no road construction.

Alternative A - Ruby Creek Drill Site (Proposed Action)

This alternative is Phillips' preferred drill site in Ruby Creek. The drill site is located in a saddle of a small ridge that extends southeast from midslope on the Line Creek Plateau.

Alternative A Drill Site Variation

This is the alternative drill site identified by the Greater Yellowstone Coalition during the comment period on the DEIS. This drill site is located on an alluvial bench approximately 2,100 feet east of the Alternative A drill site.

To assist the Forest Service and the BLM in the decision-making process, four access route variations to the above two drill sites were considered in the analysis. These are as follows:

1. Access Variation A1 (Proposed Action)

This variation is Phillips' proposed access route to the Ruby Creek drill site. Access is provided by paved Montana State Highway 72 south from Belfry, Montana, the Grove Creek Road, the Carbon County Road, and existing unimproved two track roads across BLM and private lands. This alternative would involve reconstruction of 8.8 miles of road and 0.3 miles of new construction.

2. Access Variation A2 (Meeteetse Trail - Robertson Draw Access Route)

This is the Forest Service's and the BLM's selected route. This access route is similar to Access Variation A1 except that it follows portions of the Meeteetse Trail and the Robertson Draw Road. This access variation would involve minor reconstruction of 10.8 miles of

unimproved road, major reconstruction of 6.8 miles of unimproved road, and new construction of 0.3 miles. The access alternative best meets the long-term transportation management goals of the Forest Service and the BLM.

3. Access Variation A3 (Southern Access - Robertson Draw)

This access variation would originate from Montana Highway 72 approximately 2.2 miles north of the Wyoming-Montana Border. The major aspect of this access variation is the utilization of an existing bridge across the Clarks Fork of the Yellowstone River. Extensive reconstruction, or a new bridge, would be required to support the drill rig and related traffic.

4. Access Variation A4 (Clark Wyoming Access Route)

This access variation route originates from Wyoming Highway 120 approximately 8.6 miles south of the Montana Border. This access variation would involve 7.6 miles of improved county road requiring no reconstruction, 10.1 miles of unimproved two-track road requiring major reconstruction, and 0.3 miles of new road construction.

Alternative B (Gold Creek Drill Site and Access Road)

This alternative drill site and access route is located in the Gold Creek drainage. This site is approximately one mile north of the proposed drill site in Ruby Creek. Access to this site is provided by Montana Highway 72, the Grove Creek County Road, the Carbon County Road, and existing unimproved two-track roads.

Other Alternatives Considered

In addition to the alternatives listed above, the FEIS disclosed the evaluation of other alternatives not considered in detail. They were dropped from detailed study due to: 1) their inability to meet environmental constraints, 2) land and resource management objectives, and 3) the proponents needs for an optimal initial test. Descriptions of these alternatives are found in the FEIS, Chapter 2.

V. RATIONALE FOR THE DECISION

Specific factors which weighed heavily in the selection of the Ruby A Drill Site (FEIS, p. 2-1) and Access Variation A2 (FEIS, p. 2-11) as a final decision are discussed below. No single environmental factor predominated in the choice of the selected alternative.

A. Well Site

1. In order to obtain the most accurate information related to the geologic structure and hydrocarbon potential within the lease area, the drill hole needs to enter the zones of interest as nearly vertical as possible and at the highest point on the structure. Phillips proposes to accomplish this by drilling an "S" shaped curve. The Ruby A site is closer to the proposed bottom hole location and is higher in elevation than the other alternative sites. The shorter distance and higher elevation would mean that the angles required to drill the "S" shaped curve would be less and technically easier to accomplish. It would also reduce the risk of getting the drill bit stuck in the hole and of the hole caving in. The increased distance and angle involved in the other alternatives greatly reduces the probability of hitting the targeted zones and obtaining related geologic data (FEIS, Section 2.2.3 and Appendix G).

2. An important consideration in the FS decision to approve the Ruby Creek site is the potential impact to wildlife, especially elk. I realize the area is critical winter range and

potential impact to wildlife, especially elk. I realize the area is critical winter range and is also important from a fall/rutting and spring/calving standpoint (FEIS, Chapter 3). I am also aware that the potential for significant impacts to elk is generally greater under Alternative A, Ruby Creek site than with Alternative A Variation or Alternative B, Gold Creek Site because of the saddle which is occupied in the Ruby Creek site (FEIS, Chapter 4). However, the implementation of the timing constraints discussed above in this record of Decision (ROD), the provision for further restricted timing constraints (ceasing drilling operations prior to October 15) during years of abnormal weather conditions, and the other mitigation measures prescribed in the FEIS, Chapter 5, reduce the potential impact of a two-year drilling period to an acceptable level. It should be noted that if this exploration well makes a discovery which is economically producible or results in a proposed field development program, there is potential for significant impacts to elk, and further analysis will be conducted to determine the magnitude of this impact.

3. Another factor considered by the FS was the successful reclamation of the drill sites. Based on the evidence presented in the EIS, we believe that acceptable reclamation of the Ruby Creek site and access road can be achieved (See FEIS, Chapter 4, page 4-75).

4. Lastly, in the decision to approve the Ruby Creek site the FS and BLM considered the additional amount of drilling time, loss of geological information, and high probability of not hitting the target zone from drilling from either the Gold Creek site or the Alternative A Variation Site.

5. In summary, the selection of Alternative A, Ruby Creek Site provides Phillips a reasonable opportunity to explore an existing lease for hydrocarbons and provides for mitigation of potential impacts to an acceptable level.

B. Access Route

The rationale for selection Access Variation A2 (see FEIS, P. 2-11) is as follows:

1. The major consideration in selecting this access variation over that preferred by Phillips (Access Variation A1) is that Access Variation A2 better meets the Forest Service and the BLM long-term transportation management objectives for the area, and maximizes the use of existing county transportation system. The area off the Custer National Forest contains numerous low-standard, two-track roads which are the results of random vehicle traffic. Some of this random cross-county travel may be eliminated by upgrading the road system that will service the area for the long-term. In making this decision, we realize that additional costs will be incurred by Phillips. However, we believe that the additional costs in minor reconstruction on 10.8 miles of road compared to major reconstruction of an additional 2.0 miles in Access Variation A1 (Phillips proposal) is preferable. See FEIS, Chapter 4, Table 4.1.

In addition, of the access route variations, implementation of Variation A1 would pose the greatest potential of impacting cultural resources (FEIS, Chapter 4).

2. We did not select Access Variation A3 (see FEIS, P. 2-11) for economic reasons associated with the construction/reconstruction of the bridge across the Clarks Fork of the Yellowstone River. Although this access was preferred by Carbon
County, we do not believe it is reasonable to expect Phillips to bear the cost of this project given the exploratory nature of the well.

3. We did not select Access Variation A4 (see FEIS, p. 2-12) because this route traverses approximately five miles of agricultural land from Highway 120 to the beginning of an

unimproved two-track road. In addition, narrow bands of riparian vegetation associated with Bennett Creek would be crossed. Reference FEIS, Exhibit 3-2, and Chapter 3, page 3-27.

C. Operational Period

As previously stated, the FS has decided to allow Phillips to operate between the period June 15 - October 15 unless abnormal weather conditions dictate otherwise or completion of the well within two drilling "windows" appears to be in jeopardy. The rationale of the FS for this decision is as follows:

1. A primary consideration is the importance of the saddle for elk migration and the overall project area as critical elk habitat. Based on the evidence presented in the FEIS, this window of operation mitigates impacts to elk to non-significant levels if drilling activities are limited to a two-year operational period.

2. Secondary to elk is a concern for the potential impacts to fall elk hunters. This impact can be minimized by having Phillips cease their drilling activities prior to the big game rifle season which begins approximately October 20.

As previously stated, the FS has outlined a method for establishing the exact date when Phillips will have to cease operations. The primary concern is based on the habitat requirements for elk. The FS is willing to accept some short-term impacts to recreationists in order to complete the project within the two-drilling periods.

D. Disposition of the Well Rig

In making the decision to allow Phillips to leave the rig on-site during the non-drilling period (approximately October 15 to June 14), the FS has considered the potential short-term impacts to elk and visual quality (FEIS, Chapter 4). The rationale of the FS for this decision is as follows:

1. Allowing Phillips to leave the rig on-site during the non-drilling period will afford them the maximum time to complete all activities within two drilling periods. Should Phillips decide to remove the rig it must be done by the agreed to date for cessation of operational activities, generally October 15.

2. Another factor considered in this decision is the impacts associated with moving the rig off/on-site. Depending on ground conditions in the spring of the year, some long-term ground disturbance could occur that might complicate reclamation.

3. The potential short-term impacts to elk and visual quality are less important than ensuring the drilling program will be accomplished within two years, minimizing the potential for more significant long-term impacts to the elk.

VI. FINDINGS REQUIRED BY OTHER LAWS

Based upon the findings of this environmental analysis and a review of the management direction given in the Custer Forest Plan, the Forest Service has determined that implementation of the selected alternative, Alternative A including access Alternative A2, is consistent with the requirements of the Forest Plan.

The Bureau of Land Management has determined that implementation of the selected alternative including the access alternative A2, is consistent with the requirements of the Billings Resource Area Resource Management Plan.

RECORD OF DECISION

The selected alternatives for the drill site and access route do not involve activities that would affect either floodplains or wetlands.

Through the analysis documented in the EIS, the biological evaluation, and consultation with the US Fish and Wildlife Service, we have determined that there would be no affect on any threatened or endangered species. A part of this determination is that the activities associated with this decision would not preclude or adversely affect the recovery of any threatened or endangered species.

Implementation of the selected alternative will meet State air and water quality standards and is consistent with other State and local requirements.

VII. IDENTIFICATION OF THE ENVIRONMENTALLY PREFERRED ALTERNATIVE

The No Action Alternative is the environmentally preferred alternative. Since the APD would be denied, this alternative would have no affect on the environment, except for the socioeconomic environment and the knowledge of the geologic environment.

VIII. IMPLEMENTATION DATE

Based upon the findings of the environmental analysis documented in this EIS, the Forest Service has determined that Phillips Petroleum Corporation will be given permission to implement activities governed by the Surface Use Plan of Operations on National Forest System Lands on June 15, 1990, as specified in the Conditions of Approval (COAs) made part of the Application for Permit to Drill (APD).

Road construction on lands administered by the BLM can begin before June 15, 1990. The exact starting date for these construction activities will be specified in the Right-of-Way grant which will be issued by the BLM.

IX. ADMINISTRATIVE REVIEW OPPORTUNITIES

Under the authority of the Federal Onshore Oil and Gas Leasing Reform Act, the Forest Service is responsible for approving the Surface Use Plan of Operations portion of the APD. Therefore, decisions relating to surface uses on national Forest System Lands should be appealed to the Forest Service pursuant to 36 CFR 217 or 36 CFR 251. Any written Notice of Appeal of the Forest Service decision must be fully consistent with 36 CFR 217.9 or 36 CFR 251.88, "Content of Notice of Appeal", including the reasons for appeal and must be filed within 45 days of the date of the decision to:

John W. Mumma, Regional Forester
USDA Forest Service
200 East Broadway
P.O. Box 7669
Missoula, MT 59807
Telephone (406) 329-3316

Simultaneously send a copy of the notice of appeal to my office:

Curtis W. Bates, Forest Supervisor
USDA Forest Service, Custer National Forest
2602 1st Avenue North
Billings, MT 59301
Telephone (406) 657-6361

RECORD OF DECISION

Decisions made by the Bureau of Land Management related to the approval of the Application for Permit to Drill which includes the Drilling Plan and the Contingency and Evacuation Plan are subject to review by the State Director of the Bureau of Land Management pursuant to 43 CFR 3165.3. Any adversely affected party may request administrative review, before the State Director either with or without oral presentation. Such request, including all supporting documentation shall be filed in writing within 20 business days of the date this decision is received or considered to be received to:

State Director
USDI Bureau of Land Management
Montana State Office
222 North 32nd Street
P.O. Box 36800
Billings, MT 59107
Telephone (406) 255-2904

X. CONTACT PERSONS

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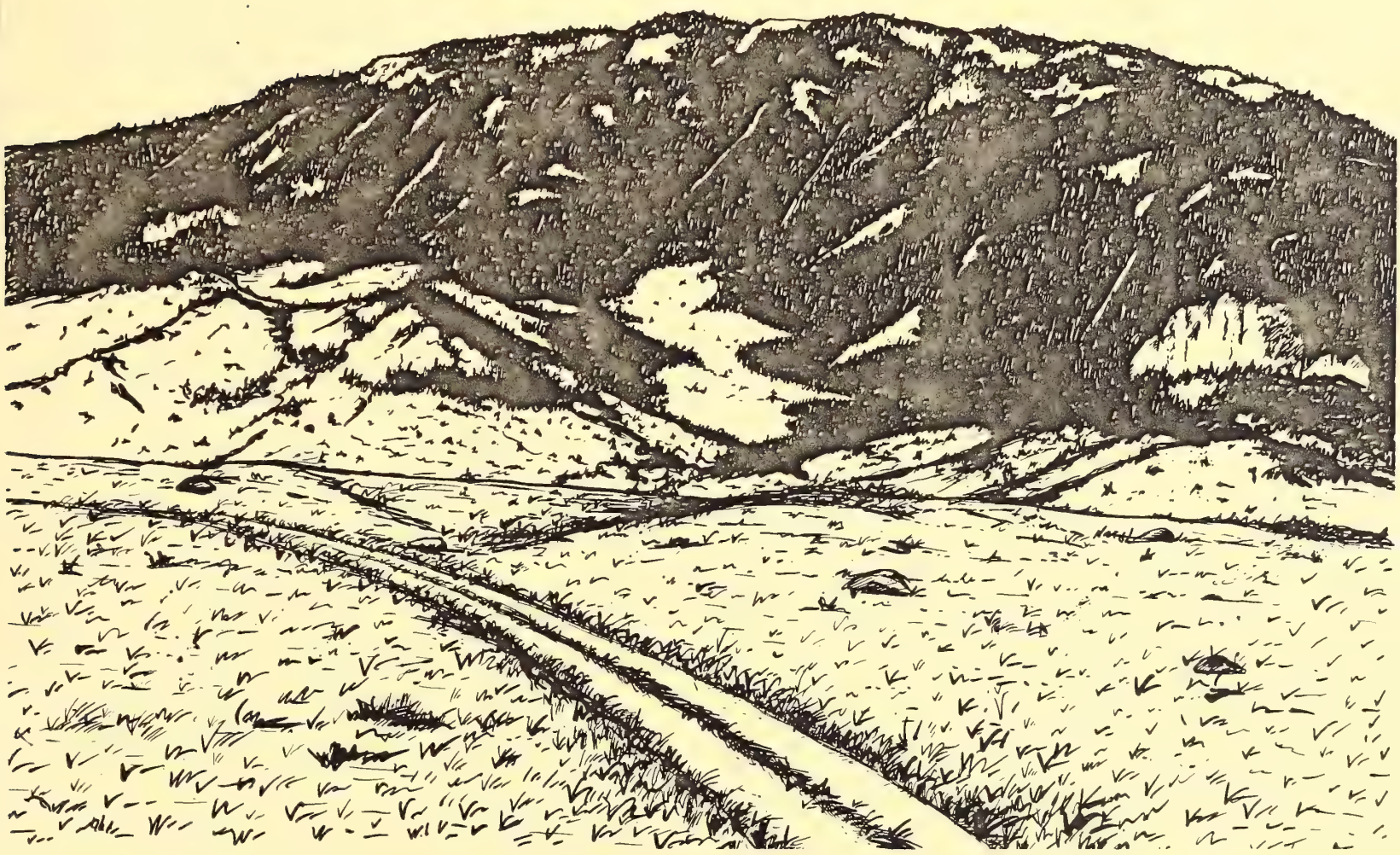
FINAL ENVIRONMENTAL IMPACT STATEMENT

Ruby A Federal No. 1-9
Exploratory Oil/Gas Well

Proposed Oil and Gas Drilling
Near Red Lodge, Carbon County, Montana



Department of Agriculture
Forest Service
Custer National Forest

Department of the Interior
Bureau of Land Management
Miles City District

RUBY A FEDERAL NO. 1-9
EXPLORATORY OIL/GAS WELL

FINAL
ENVIRONMENTAL IMPACT STATEMENT

Prepared By

U.S. Department of Agriculture
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Gary Holsan Environmental Planning

February 22, 1990

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U.S. Forest Service
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Matt Millenbach
District Manager
Miles City District
Bureau of Land Management
Miles City, Montana

COVER SHEET

RUBY A FEDERAL NO. 1-9 EXPLORATORY OIL/GAS WELL
FINAL ENVIRONMENTAL IMPACT STATEMENT

( ) DRAFT (X) *COMPLETE* FINAL

Lead Agency	U.S. Department of Agriculture Forest Service Custer National Forest P.O. Box 2556 Billings, Montana 59103
Joint Lead Agency	U.S. Department of the Interior Bureau of Land Management Miles City District P.O. Box 940 Miles City, Montana 59301
Cooperating Agencies	U.S. Department of the Interior Fish & Wildlife Service U.S. Department of the Army, Corps of Engineers U.S. Environmental Protection Agency
Counties That Could Be Directly Affected	Carbon County, Montana Park County, Wyoming

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ABSTRACT

Phillips Petroleum Company (Phillips) proposes to drill the *Ruby A Federal No. 1-9 Exploratory Oil/Gas Well* on the Custer National Forest near Red Lodge, Montana.

Pursuant to the National Environmental Policy Act (NEPA), this *Final* Environmental Impact Statement (FEIS) analyzes the environmental effects of the proposed drilling including the construction and operation of an access road and drill pad in Carbon County, Montana.

This FEIS analyzes the impacts of drilling the proposed exploratory well with an access road from Montana State Highway 72 to the drill site in the Ruby Creek drainage, *a variation drill site near the proposed drill site*, and an alternative access route and drill site located north of the proposed site in the Gold Creek drainage. *Each of the three* drill sites are located east of the Line Creek Plateau on the Beartooth Ranger District of the Custer National Forest. The No Action alternative is also analyzed.

Based on the issues and concerns identified during the scoping process, *and the comments received on the Draft EIS (DEIS),* the FEIS focuses on the impacts to air quality, transportation, geology and soils, water resources, vegetation resources, wildlife, visual resources, recreation, socioeconomics, cultural resources, and health and safety.

Key issues include disruption of significant scenic, wildlife, and recreation resources in the project area; impacts on big game hunting; impacts to the biological components of the Greater Yellowstone Area; impacts related to new road construction on Forest lands currently managed as closed to vehicular traffic; cumulative effects on elk habitat and other natural resources; impacts on elk winter and summer range and historical migration routes; impacts related to reclamation feasibility; and public safety hazard associated with the accidental release of hydrogen sulfide during drilling. The following opportunities were identified: Phillips could pursue the opportunity of evaluating their leasehold for hydrocarbon potential; project implementation could result in economic benefit to nearby communities; and the potential for improving existing Bureau of Land Management (BLM) and private roads.

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PREFACE

Summary

This Final Environmental Impact Statement (FEIS) presents facts and analyzes the environmental effects pertaining to the Proposed Action and Alternatives for the drilling of an exploratory oil/gas well, including the construction and operation of an access road and drill pad. This FEIS provides pertinent information in sufficient detail for the public to understand the project.

The FEIS has been prepared according to the requirements of the National Environmental Policy Act of 1969 (NEPA) and the Council on Environmental Quality's (CEQ) regulations for implementing NEPA, effective July 30, 1979.

In addition to the six chapters and the appendices in the FEIS, there are separate technical reports that support the FEIS. Technical reports were prepared on the following topics:

- Geology/Soils
- Water Resources
- Vegetation, Timber, and Range Resources
- Wildlife
- Visual Resources
- Recreation
- Socioeconomics
- Engineering

The technical reports *are on file at* the Forest Service (FS) offices in Billings and Red Lodge, Montana, and at the Bureau of Land Management (BLM), Miles City or Billings, Montana.

Review Comments on the DEIS and Preparation of the FEIS

The review/comment period on the DEIS lasted from the date of issuance of the DEIS in late-May until July 10, 1989. During this time, 34 comment letters were submitted to the Forest Service and two sets of public meetings/workshops were held to solicit additional comments. Appendix H presents the comment letters submitted and responses to these comments prepared by the Forest Service, Bureau of Land Management, and the Interdisciplinary Team (IDT).

The DEIS was revised to produce the FEIS. The revisions made were invoked by comments received on the DEIS and agency and IDT review of the DEIS. These revisions are shown italicized within the standard text print.

Document Organization

This FEIS has been designed to inform reviewers about resources in the project area; potential impacts that could occur to these resources due to project implementation; and appropriate mitigation measures that, if implemented properly, would minimize these potential impacts. Resource elements within the project area include air resources; transportation; geology and soils; water quality; vegetation, timber, and range resources; wildlife; visual resources; recreation; socioeconomics; cultural resources; and health and safety.

To make the material in this document more readily available to users, information presented on the general topics mentioned above can be found in the following sections and chapters:

- **Summary Chapter** - provides an overview of the proposed project and issues and concerns associated with the proposal, identifies potential impacts, and suggests appropriate mitigation for minimizing adverse impacts.

- **Chapter 1, Introduction** - discusses administrative issues relevant to the proposed project. Such issues include land management, applicable laws, and issues and concerns.

- **Chapter 2, Proposed Action and Alternatives** - describes the proposed action and alternatives, including the No Action Alternative, that will be analyzed in detail in terms of impacts to the various resource elements listed above.

- **Chapter 3, Affected Environment** - describes the existing condition of the environment by resource element. The detail presented in this chapter provides the basis for and supports the analysis of

impacts that could occur due to project implementation.

- **Chapter 4, Environmental Consequences** - presents the detailed analysis of impacts that could occur to the proposed action and alternatives. The introduction section of this chapter provides a "user guide" to the detail presented for each step in the impact analysis flow path. The reader who wants to assimilate the detail of the impact analysis is urged to study the "user guide" before proceeding with the rest of the chapter. The reader who wants to learn the conclusion of the impact analysis without reading the detail presented under each resource is urged to read the Comparative Analysis section of this chapter.

- **Chapter 5, Mitigation and Monitoring** - summarizes the mitigation measures that should be implemented to minimize the severity of adverse impacts to each resource element.

- **Chapter 6, Consultation and Coordination** - summarizes the public and agency involvement process and includes a list of interested private citizens, public interest groups, and agencies who were sent copies of the DEIS, *who provided comment on the DEIS, and who were sent copies of the FEIS.*

- ***Appendix A, Lease Stipulations*** - *legal requirements for conducting activities on Phillips' leasehold.*

- **Appendix B, Field Development** - discusses reasonable foreseeable field development, potential adverse impacts that could occur due to field development, and a summary of relevant mitigation measures that could be implemented to minimize adverse impacts.

- ***Appendix C, Engineering Analysis: Bridge Reconstruction Report*** - *discusses the requirements and logistics of reconstructing the truss bridge over the Clarks Fork.*

- ***Appendix D, Site-Specific Erosion Control, Revegetation, and Rehabilitation Plan (ERRP)*** - *presents the plan for reclaiming, revegetating, and controlling surface runoff and soil erosion from disturbances associated with this project.*

- ***Appendix E, Contingency and Evacuation Plan*** - *presents the plan for action if an accidental release of H_2S occured during drilling.*

- ***Appendix F, Biological Evaluation*** - *detailed discussion and evaluation on the occurrence of, and impacts and mitigation of impacts on federally threatened and endangered species and candidate species for federal listing in the project area.*

- ***Appendix G, Directional Drilling Analysis*** - *discusses the feasibility of directional drilling from several drill sites considered in the analysis.*

- ***Appendix H, Review Comments and Responses*** - *presents the reviewer comment letters and responses prepared on the comments.*

The detailed Table of Contents contained in this FEIS provides a listing of the various sections included in each chapter and also serves as a detailed index.

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SUMMARY

SUMMARY

SUMMARY

S.0 SUMMARY

S.1 BACKGROUND

This Environmental Impact Statement (EIS) analyzes the impacts of Phillips Petroleum Company's proposal to drill an exploratory oil/gas well and test the *potential* hydrocarbon bearing formations at a site located in the Ruby Creek drainage on the east side of the Line Creek Plateau on the Beartooth Ranger District of the Custer National Forest. The drilling proposal is known as the Ruby A Federal No. 1-9 exploratory oil/gas well project. The proposed site is located in the northwest quarter of the northwest quarter of Section 15, Township 9 South, Range 20 East (NW1/4 NW1/4 Sec 15 T9S R20E), Carbon County, Montana, approximately 12 miles south of Red Lodge and 16 miles southwest of Belfry, Montana (Exhibits 1-1 and 1-2).

Phillips Petroleum Company (Phillips), the proponent of the exploratory drilling action, originally filed an Application for Permit to Drill (APD) with the Bureau of Land Management (BLM), Miles City District Office, on January 21, 1988, for a drill site on the Line Creek Plateau located in the NE1/4 NW1/4 of Sec 9 T9S R20E. Public scoping was conducted during March and April of 1988 to solicit public comments on the proposed action. Substantial public opinion was expressed against the proposal due to the sensitivity of the Line Creek Plateau environment and associated natural resources. In addition, re-evaluation of seismic data caused a shift in the perceived location of the target geologic structure, thereby making a directional drilling attempt physically possible. Due to the sensitivity of the alpine environment of the Line Creek Plateau and substantial public opposition to the original proposal, Phillips withdrew its original proposal for drilling on the plateau on July 5, 1988. On August 3, 1988, Phillips filed a revised APD for directionally drilling an exploratory well on the east side of the Line Creek Plateau.

This EIS was prepared in response to the concern of Forest Service (FS) and BLM responsible officials that the project may significantly affect the human environment. They further concluded that an EIS would be required to enable the FS and BLM to ensure that the final decision is informed and based on relevant factors and that the full National Environmental Policy Act (NEPA) process would result in enforceable mitigation measures through the Record of Decision (ROD).

S.2 PROPOSED ACTION AND ALTERNATIVES

S.2.1 Alternative A (Proposed Action) - Ruby Creek Drill Site and Access Route

Phillips proposes to directionally drill a 12,520-foot exploratory oil/gas well on the Beartooth Ranger District, Custer National Forest, Carbon County, Montana. The drilling proposal is located in the Ruby Creek drainage, a tributary to the Clarks Fork of the Yellowstone River. The drill site is located in the NW1/4 NW1/4 of Sec 15 T9S R20E (Exhibits 1-1, 1-2, 2-2, and 2-3) at an elevation of 7,000 feet. Access to the proposed site would utilize 4.3 miles of Montana State Highway 72 south from Belfry, Montana, to Grove Creek Road, an existing improved county road. From this point, access would head west towards the drill site, utilizing 5.0 miles of Grove Creek Road and approximately 8.0 miles of existing unimproved "two-track" roads to the Custer National Forest boundary (Forest boundary).

Access to the Forest boundary would traverse BLM-administered land and land under private ownership. From the Forest boundary, access would utilize approximately 0.8 miles of unimproved two-track road to its terminus. To reach the drill site from this point would require approximately 0.3 miles of new road construction. Phillips proposes to construct a 1.7-acre drill pad. Disturbance associated with this alternative would include 21.3 acres of existing road reconstruction (two-track), 1.5 acres of new road construction, a 1.7-acre drill pad, and 0.8 acres of cut and fill slopes and topsoil stockpile associated with the drill site. Total disturbance would be 25.3 acres.

S.2.1.1 Alternative A Access Route Variations

To facilitate the agencies' decision-making process, three Alternative A access route

variations were reviewed. These variations are described in detail in the Transportation Sections of Chapters 3 and 4. They involve utilizing public roads in the project area that provide certain management opportunities to county and federal agencies, and a route to the south towards Clark, Wyoming.

S.2.1.2 Alternative A Drill Site Variation

An alternative drill site location was identified during the public review of the Draft Environmental Impact Statement (DEIS). This variation drill site is located approximately 2,100 feet east of and 500 feet below the proposed drill site on an alluvial bench at an elevation of 6,500 feet. This variation drill site was primarily identified in regard to impacts on elk migration.

S.2.2 Alternatives to the Proposed Action

As identified through interdisciplinary review, alternatives to the proposed action include an alternative drill site and access route, known as the Gold Creek Drill Site and Access Route, and the "No Action" Alternative.

S.2.2.1 Alternative B - Gold Creek Drill Site and Access Route

The Gold Creek drill site is located in the Gold Creek drainage in the SW1/4 NE1/4 of Sec 10 T9S R20E. Access to this site would utilize the same route as described under the proposed action to the terminus of Grove Creek Road. From that point, access would head west utilizing existing unimproved two-track roads leading to Gold Creek for 5.3 miles to an abandoned drill site. An additional 0.9 miles of new road construction would be required to access the drill site from this point, of which 0.5 miles would occur on Forest land. A 2.2-acre drill pad would be constructed at the Gold Creek drill site. Disturbance associated with this alternative would include 12.9 acres of existing road reconstruction (two-track), 4.4 acres of new road construction, a 2.2-acre drill pad, and 0.8 acres of cut and fill slopes and topsoil stock pile associated with the drill site. Total disturbance would be 20.3 acres.

S.2.2.2 No Action Alternative

The third alternative to be analyzed is the "No Action" Alternative. For the Ruby A Federal Prospect, the No Action Alternative would result in denial of the APD. This alternative would provide for the continuance of other land management activities presently occurring in the project area. Selection of the "No Action" Alternative could occur if the proposed surface use plan of development were determined to be in irreconcilable conflict with lease terms and stipulations or would result in unacceptable, adverse environmental effects. The No Action Alternative is discussed in greater detail in Chapters 2 and 4.

S.2.2.3 Alternatives Considered But Not Analyzed In Detail

In addition to Alternatives A and B and the No Action Alternative, other alternatives were considered but not fully evaluated due to their inability to meet environmental constraints, land and resource management objectives, and the proponent's need for an optimal initial drilling test. These alternatives include the following:

- Drill the well from a site located in the NE1/4 NW1/4 of Sec 9 T9S R20E on the north end of the Line Creek Plateau. This alternative was Phillips' original proposed drilling site. It was not fully evaluated since the strong public voice against this original drill site reduced its feasibility.

- Directionally drill the well from a site located on private land to the east of the proposed drill site. This alternative would involve directionally drilling the well from a private land location east of the proposed Ruby Creek site. This alternative was dropped from further consideration since this location is situated sufficiently far from the target geologic structure to preclude obtaining the necessary information about the structure. Therefore, this alternative was determined to not be feasible. Section 2.2.3 of Chapter 2 discusses the limitations of directional drilling in greater detail.

- Drill the well from a site located in the NE1/4 NE1/4 of Sec 9 T9S R20E on the north end of the Line Creek Plateau using helicopter mobilization and support. This alternative was considered in conjunction with the original drilling proposal on the north end of the Line Creek Plateau. This alternative called for accessing the drill site using helicopter mobilization and support

methods rather than roaded or over-the-ground access. This alternative was not fully evaluated because of the high cost and technical difficulties of *using a helicopter to mobilize a drill rig at the plateau.* The high elevations (nearly 10,000 feet) combined with strong winds and a short, unfavorable operating season made this alternative infeasible from a safe operation aspect.

S.3 SCOPE OF ANALYSIS

Public issues and comments regarding the Phillips proposal were solicited for incorporation into this EIS through the scoping process *and the review of the DEIS.* Initial scoping for the Ruby A Federal well proposal consisted of preparation and submittal of a scoping letter to interested individuals, organizations, and companies for the original proposal on the Line Creek Plateau. The scoping letter contained the location and submittal date of the APD; described the action to be analyzed; identified preliminary land and resource management issues, concerns and opportunities; and outlined timing constraints for public involvement. In addition, the letter provided information on how groups/individuals/ agencies could become involved in the analysis process. The letters were mailed to people and organizations who showed an interest in this specific proposal and to those people and organizations who showed an interest in similar projects in the past. Interested groups/individuals were requested to comment by the scoping period deadline of May 2, 1988. In addition to the scoping letter, scoping meetings and open house information sessions were held by the FS and BLM in Red Lodge on March 22 and 23, 1988 and in Billings on April 11 and 12, 1988. Additional scoping was accomplished through the news media (newspapers, television, and radio). With the submittal of a new APD for drilling off the Line Creek Plateau, the FS and BLM determined that a public meeting conducted by Phillips, combined with news releases to the local news media would be adequate to inform the public on changes in the drilling proposal. Phillips conducted a public meeting in Red Lodge on August 18, 1988. News releases on the revised drilling proposal were submitted to the local news media in Red Lodge, Billings, and Columbus, Montana, and Cody, Wyoming.

Concerns and issues identified during the final scoping, in addition to concerns and issues generated by the agencies and the interdisciplinary team (IDT), were analyzed in detail in the DEIS. In addition, public review of and comment on the DEIS were solicited from May 25 through July 10, 1988. The FS, BLM, and the IDT processed and analyzed these comments in the FEIS.

Issues and concerns generated during the scoping period *and DEIS review* included disruption of significant scenic, wildlife, and recreation resources in the project area; impacts on big game hunting; impacts to the biological components of the Greater Yellowstone Area; impacts related to new road construction on Forest lands currently managed as closed to unauthorized vehicular traffic; cumulative effects on elk habitat and other natural resources; impacts on elk winter and summer range and historical migration routes; impacts related to reclamation feasibility; and public safety hazard associated with the accidental release of hydrogen sulfide during drilling. Opportunities were identified and included the following: Phillips could pursue the opportunity of evaluating their lease-hold for hydrocarbon potential, project implementation could result in economic benefit to nearby communities as a result of goods and services needed for the drilling action; the potential for Carbon County and the State of Montana to obtain royalty receipts if the well were productive; the public would benefit from the use and sales of their mineral resources by generating revenues for the federal treasury; and the potential for improving existing BLM and private roads.

S.4 MAJOR IMPACT CONCLUSIONS

Drilling of the proposed Ruby A Federal exploratory well would cause short-term disturbance to and displacement of components of the human and natural environments. Potential environmental impacts that could result from implementation of the proposed action or alternatives are detailed in Chapter 4 of the EIS, with a comparative analysis also included in Chapter 4. Proposed mitigation measures are presented in Chapter 5. Appendix B of this EIS discloses an estimate of the possible future actions and effects that could potentially result from developing this prospect.

SUMMARY

S.4.1 Air Quality

Implementation of the proposed action would have no significant impact on air quality either in the short- or long-term. Impacts on air quality are discussed in greater detail in Section 4.1 and in Appendix B.

S.4.2 Transportation

No significant impacts would occur due to project implementation. Adverse impacts that could occur to transportation include increased traffic levels, decreased driver comfort, and increased accident probabilities. Should these occur, they would be short-term impacts. Implementation of the project could have long-term management implications relative to road use in the project area. Impacts on transportation are described in detail in Section 4.2. Additional discussion is provided in Appendix B.

S.4.3 Geology/Soils

No significant impacts on the geologic environment are expected. Geologic hazards are not likely to impact the proposed project. *The location of the drill site would be important in obtaining the necessary information about the target geologic structure for assessing potential production.* Soil impacts would primarily relate to increased soil erosion, reduction in topsoil productivity, and reclamation feasibility. In general, soils in the project area have poor to fair reclamation feasibility due to low fertility, shallow topsoil, and high coarse fragment contents. With aggressive reclamation, erosion control, and selective topsoil handling as discussed in Appendix D, soil productivity and erosion could be maintained and returned to predisturbance condition. No significant impacts to soils are expected to occur with project implementation. Impacts on the geological and soils environments are discussed in detail in Section 4.3 and in Appendix B.

S.4.4 Water Resources

Construction and operation of access roads adjacent to the stream environment could cause increased erosion and subsequent sedimentation in Ruby and Gold creeks. The potential exists for contamination of surface water by spilled fuel or drilling fluid, and contamination of freshwater aquifers by drilling fluids or mixing of groundwater. Implementation of proposed measures, best management practices, *and the requirements of On-shore Oil and Gas Order #2 (43CFR 3160)* would greatly reduce the potential of these impacts occurring. Fisheries would not be impacted since neither Ruby or Gold creeks contain suitable habitat. Existing water rights and claims in the project area would not be impacted. No significant impacts to water resources would occur due to project implementation. Impacts to water resources are described in detail in Section 4.4 and in Appendix B.

S.4.5 Vegetation, Timber, and Range Resources

Impacts to these resources directly relate to the clearing and disturbance of vegetation due to drill site and access road construction. Revegetation could be difficult due to low soil fertility and high coarse fragment content. Aggressive reclamation and revegetation techniques would be required to successfully revegetate disturbed areas. These techniques are discussed in Appendix D. Wetlands are of particular importance as sensitive and unique community types protected under the Clean Water Act. Minimal impact would occur to wetlands due to project implementation. Range resources could be impacted through the reduction of forage, altered livestock movement and management, and increased potential for livestock/vehicle collision. No significant impacts on these resources are expected. Impacts to vegetation and related resources are described in detail in Section 4.5 and in Appendix B.

S.4.6 Wildlife

Significant impacts to wildlife could occur, but are avoidable and unlikely to happen if prescribed mitigation measures are implemented. Significant impacts that, unless mitigated, could occur are listed in the order of their decreasing probability: 1) the displacement of elk from winter, spring, and fall ranges, 2) the displacement of black bears from spring/fall ranges, 3) an increase of more than 10 percent in the short-term direct mortality of wildlife species caused by collisions with motor vehicles, and 4) the death or injury of a federally-listed or candidate species of wildlife caused by a collision with a motor vehicle. No significant impacts are expected to occur with the

implementation of appropriate mitigation. Impacts to wildlife are described in detail in Section 4.6 and in Appendix B. The Biological Evaluation as it pertains to federally listed species and candidate species for federal listing is presented in Appendix F.

S.4.7 Visual Resources

The short-term impacts associated with the construction of the drill pad and erection of the drill rig at the drill sites would be considered significant from most viewer positions, due to contrasts in line, form, and possibly color that exceed levels prescribed by existing management direction for the area of interest. Removal of the drill rig and application of recommended mitigation would bring the sites into compliance with management direction. Rig lights associated with night drilling operations would be visible from Montana State Highway 72 to the east and Carbon County roads in the area. The construction of access roads would produce additional impacts to the visual resource. Widening of existing unimproved roads and trails and construction of new road on Forest lands would increase the level of line contrast in the existing landscape. The level of contrast would be considered significant in the short term from viewer positions at or above the site of disturbance. Impacts to visual resources are described in detail in Section 4.7 and Appendix B.

S.4.8 Recreation

Recreation impacts associated with the proposed drill site location would include changes in the recreation opportunity characteristics of the project area, short-term displacement of limited numbers of recreationists, and a deterioration of the recreation experiences available to others who would continue to use the surrounding areas. The seasonal period designated for drilling activities would interfere with big game hunting which is the primary recreation use occurring in the vicinity of both drill sites. Bow hunters could be the largest and most impacted user group affected since construction and drilling activities would likely overlap with the archery season. These impacts would be of relatively short duration for an exploratory drilling project and would be insignificant especially if only one hunting season were disrupted. Beneficial consequences could result from improved public access to Forest lands providing opportunities for dispersed recreation. Impacts to recreation are described in detail in Section 4.8 and in Appendix B.

S.4.9 Socioeconomics

Minimal negative socioeconomic impacts would result from project implementation. Some individuals, such as a few hunting outfitters or residences within the project area may be adversely affected. Additional people may feel that the economic future of the area lies not in extractive industries but in recreation/tourism. The negative economic impacts include a minimal loss of recreation benefits. These impacts are offset by property taxes and a substantial increase in community revenue flows. Impacts to the social and economic environments are described in detail in Section 4.9 and in Appendix B.

S.4.10 Cultural Resources

Six cultural resource sites were located along portions of the access routes considered in the proposed project. These sites include the Meeteetse Trail, the Dilworth Post Office complex, and prehistoric artifacts. Each access alternative or variation would impact cultural resources. Alternative A Access Variation A1 (proposed route) and Alternative B would impact cultural resources the most of all routes. See Section 4.10 and Appendix B for more detail on potential impacts to cultural resources.

S.4.11 Health and Safety

No significant impacts from hydrogen sulfide exposure or the increase in vehicular traffic are expected, provided that best management precautions, applicable mitigation measures, *and requirements of On-shore Oil and Gas Order #2 (43CFR 3160)* are followed. Impacts to health and safety are described in detail in Section 4.11 and in Appendix B.

S.5 MITIGATION AND MONITORING

Mitigation measures and monitoring requirements have been identified through the analysis of potential impacts in Chapter 4, Environmental Consequences. These measures and requirements are summarized in Chapter 5, Mitigation and Monitoring. The measures and requirements describe how construction,

drilling operations, and reclamation should be managed to assure compliance with the applicable lease stipulations and resource limitations identified during the interdisciplinary analysis.

INTRODUCTION

Chapter 1

INTRODUCTION

Chapter 1

CHAPTER 1

1.0 INTRODUCTION

1.1 PROJECT BACKGROUND

Phillips Petroleum Company (Phillips) filed an Application for Permit to Drill (APD) with the Bureau of Land Management (BLM) on January 21, 1988, to drill an exploratory oil/gas well in the northeast quarter of the northwest quarter of Section 9, Township 9 South, Range 20 East (NE1/4 NW1/4 of Section 9 T9S R20E) Montana Principle Meridian (MPM). The drill site proposal was located at an elevation of 9,367 feet on a flat bench located on the north end of the Line Creek Plateau (Exhibit 2-8). Approximately 12 miles of access route was proposed to reach the drill site from the Beartooth Highway (U.S. Highway 212). Elevations along the access route varied from 10,700 feet at the junction of the proposed new access road with U.S. Highway 212 to the drill pad elevation. The access route was located above timberline in high alpine meadow vegetation.

Prior to the filing of the APD, an interdisciplinary team (IDT) conducted a field review of the proposed drill site, potentially suitable alternate sites, access alternatives, and water sources on November 10, 11, and 12, 1987, with representatives of the Forest Service (FS), the BLM, and Phillips. Interdisciplinary participation was provided by a third party contractor, a private consultant, selected by and working under the direction of and in cooperation with the FS and BLM.

Following on-site investigations of the proposed Line Creek Plateau drill site and access route in November 1987, the FS and BLM initiated the public scoping process. Scoping meetings and open houses were conducted to solicit public input regarding the proposed action. A scoping meeting was held in Red Lodge, Montana, by the FS and BLM on Tuesday, March 22, followed by an open house on Wednesday, March 23. Considerable public interest was voiced to hold public meetings in Billings, Montana, during the scoping period. As a result of this public interest, the FS and BLM conducted a public meeting in Billings on April 11, followed by an open house in Billings on April 12. Oral and written comments were taken at the public meeting sessions and at the open house sessions (See Chapter 6, Consultation and Coordination).

Unfavorable public reaction to the drilling proposal was received during the scoping period due to perceived adverse impacts to the scenic qualities of the area, wildlife, vegetation, recreation, socioeconomics, and other resource values.

After the original APD was submitted in January 1988 and based on the results of the scoping process, Phillips informed the FS (July 5, 1988) that the drilling proposal was being withdrawn by Phillips and that they would submit a new APD for a surface location on the east face of the Line Creek Plateau. The drilling objectives for this new drill site would be essentially the same as previously proposed except the bore hole would be directionally drilled to the bottomhole location in the SW1/4 SE1/4 of Section 9 T9S R20E. Phillips' reasons for the change in drill site location included the following:

- Public controversy and the wide range of environmental issues identified during scoping and initial analysis of the environmental sensitivity of the Line Creek Plateau.

- Modification in the seismic data interpretation shifted the geologic structure to the southeast and made a directional well technically feasible and a more acceptable risk.

The revised proposal was submitted to the FS and BLM on August 3, 1988. The FS and BLM determined at this time that a public meeting conducted by Phillips, combined with news releases to the local news media, would adequately inform the public of changes in the drilling proposal. Phillips conducted a public meeting in Red Lodge on August 18, 1988. News releases on the revised drilling proposal were submitted to the local news media in Red Lodge, Billings, and Columbus, Montana, and Cody, Wyoming.

Based upon sensitive environmental issues associated with the revised drilling proposal identified during additional public involvement, the responsible FS and BLM

officials for the project concluded that the Phillips proposal may significantly affect the human environment and that an EIS is required. The EIS analysis process for the revised drilling proposal commenced in September 1988.

The revised drill site location, access road, and alternatives to the proposed action were reviewed by the FS, BLM, Phillips, and the consultant interdisciplinary team during site visits in September and October 1988.

1.2 PROJECT LOCATION AND DESCRIPTION

The Phillips drilling proposal, known as the Ruby A Federal No. 1-9 Exploratory Oil/Gas Well (Ruby A Federal) is located in the Ruby Creek drainage, a tributary of the Clarks Fork of the Yellowstone River, Carbon County, Montana (Exhibits 1-1 and 1-2). The project area is located approximately 12 miles south of Red Lodge and 16 miles southwest of Belfry, Montana, in the NW1/4 NW1/4 of Section 15 T9S R20E MPM.

The proposed project involves construction of a 1.7-acre drill pad; upgrade and reconstruction of 8.8 miles of existing unimproved road; construction of 0.3 miles of new access road; directional drilling of a single exploration well; production testing of hydrocarbon bearing formations; and reclamation of the drill site and access road if drilling is non-productive. Phillips proposes to start reconstruction of existing roads, construction of new access road and the drill site as soon as authorized after APD approval. Reconstruction and construction activities are expected to take four to six weeks. The drilling and well testing activities are expected to take about 150 days, barring any major drilling difficulties.

1.3 PURPOSE AND NEED FOR ACTION

Phillips has proposed the Ruby A Federal exploratory well to determine if hydrocarbons are present within the leasehold. If hydrocarbons are encountered, their production potential would be evaluated.

The purpose of this EIS is to provide the decision-makers with information needed to base a final decision that is fully informed and based on factors relevant to the proposal. It also serves as the summary documentation of analysis conducted on the proposal and alternatives in order to identify environmental impacts and mitigation measures necessary to address issues. The EIS also provides a vehicle for public review and comment on Phillips' proposal, the environmental analysis, and conclusions about the relevant issues.

Private exploration and development of federal oil and gas leases are an integral part of the BLM's oil and gas leasing program under authority of the Mineral Leasing Act of 1920. The overall oil and gas leasing program is provided to encourage development of domestic oil and gas reserves to reduce the United States' dependence on foreign energy supplies.

1.4 ENVIRONMENTAL ANALYSIS PROCESS

The BLM *and FS*, as authorized by the Council on Environmental Quality (CEQ) and the National Environmental Policy Act (NEPA) directives, analyzes actions involving federal leases as to their impact on the human environment (40 CFR, Parts 1500-1508). The analysis is to determine whether approval of the action would constitute a "major" federal action necessitating preparation of an EIS. The analysis uses an accepted process for evaluating and disclosing the potential environmental consequences of the proposed action and alternatives.

The FS, Custer National Forest, Billings, Montana, is the lead agency responsible for preparation of this EIS, and the BLM, Miles City District, Miles City, Montana, is the joint lead agency. The evaluation of this proposal, including alternatives, was developed through interdisciplinary field review with representatives from Phillips, the FS, the BLM, and the IDT.

The factors considered during the environmental analysis process regarding the Phillips proposal include the following:

- o A determination of whether or not the proposal conforms with BLM and FS policies, regulations, and approved land management direction pertaining to oil and gas exploration and development activities.

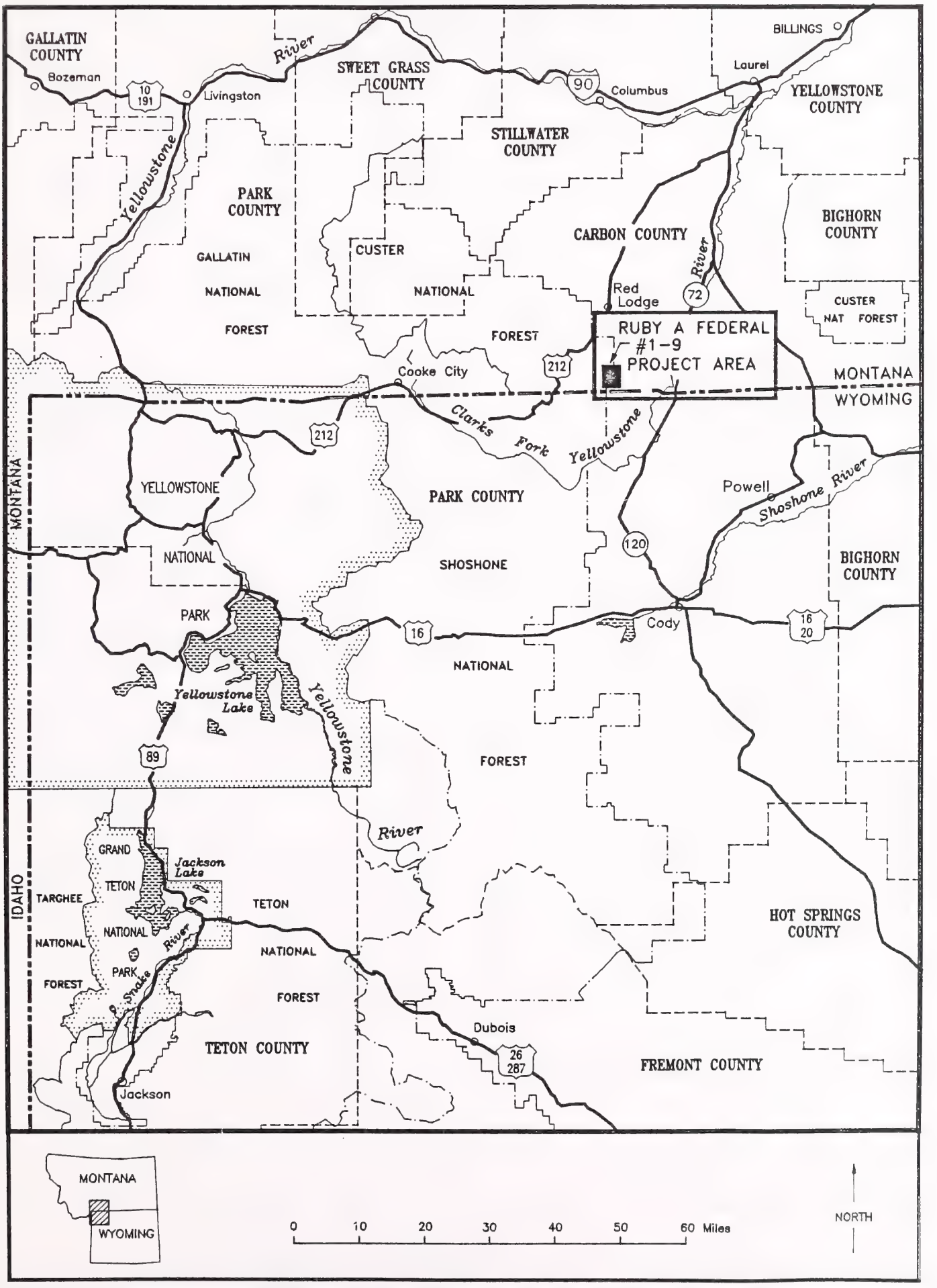

Exhibit 1-1. Location of Phillips' Ruby A Federal No. 1-9 Exploratory Well Project.

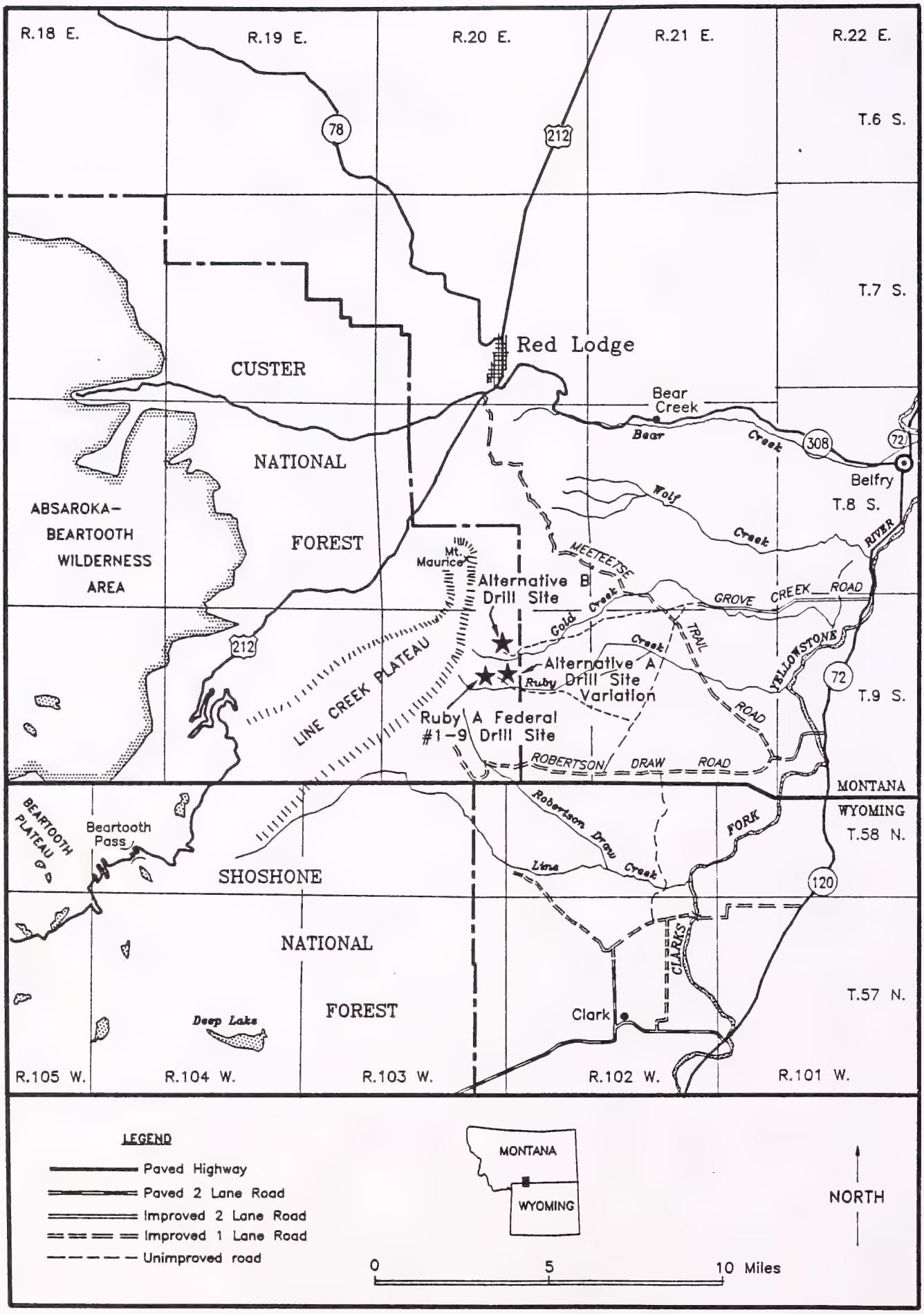

Exhibit 1-2. Location of Phillips' Ruby A Federal No. 1-9 Exploratory Well Project in the Red Lodge, Montana Area.

- o A determination of whether the drilling proposal could be conducted in accordance with stipulations contained in leases M-60558 and M-58856 (refer to Appendix A - Lease Stipulations).

- o A determination of whether a location for a drill site and access route exists that would be environmentally suitable and would meet the needs of other resource management activities and acceptably mitigate surface resource impacts, while honoring Phillips' lease rights.

This EIS is not a decision document. It documents the process used to analyze the effects of the proposal and alternatives and discloses the effects of the proposed action and alternatives to that action. A Record of Decision (ROD) signed by the responsible officials will document the decision regarding the proposal. The FS/BLM decision will relate primarily to lands administered by the FS and BLM. Decisions by the responsible officials regarding use of transportation networks in the project area by Phillips may affect private land owners, county administration of these roads, and public access to FS and BLM lands.

1.5 LAND STATUS, LEGAL, AND POLICY CONSIDERATIONS

1.5.1 Land Status

The surface area involved with the Phillips drill site proposal is under the administrative jurisdiction of the FS. The mineral estate is under the authority of the BLM. No other land ownership within the analysis area within the Custer National Forest boundary (Forest boundary) is involved with the drilling proposal; however, a portion of the proposed access route is located off the Custer National Forest on BLM, county, and private lands.

1.5.2 Management Direction

The document that directs management of FS-administered lands within the project area is the Custer National Forest Land and Resource Management Plan (LRMP) (USDA-FS 1987*b*). The goal of minerals management on the Custer National Forest, as stated in Forest-wide Management Direction, is to be responsive to the national demand for energy and strategic minerals consistent with other resource objectives. Management standards, applicable to the various resource and land use activities on the Custer National Forest, have been established and can be reviewed in Chapter II of the Custer National Forest LRMP. In regard to the BLM-administered lands, the Billings Resource Area Management Plan (RMP) (USDI-BLM 1983) provides general management direction.

The Ruby A Federal proposal is located in Management Area C as described in the LRMP. A summary of objectives and prescribed management standards for Management Area C are presented in the following sections. Management Area C also includes Management Area M and consists of all riparian areas and wetlands contained on the Forest. Since these areas have not been mapped on a Forest-wide basis, the distribution of Management Area M is not specifically known. Riparian areas do occur within the project area, and therefore these areas fall under the management objectives presented for Management Area M. In regard to the proposed project, pertinent direction for Management Area M includes allowing oil and gas activities on a limited surface use basis, and facilities (i.e., roads) may be constructed in these areas only to cross them.

1.5.2.1 Management Area C - Description and Management Standards

Lands within Multiple-use Management Area C include those areas that are important to the perpetuation of selected wildlife and fish species. On the Beartooth Ranger District of the Custer National Forest, the Selected Species is elk. The goal of this area is to manage elk habitat areas for the optimum quality and diversity that the land can offer. Other resource activities will be modified to maintain or improve the existing habitat.

1.5.2.2 Management Area C Standards (applicable to the drilling proposal)

Recreation:

- o Portions of the big game range will be seasonally closed to off-road vehicles as determined by on-the-ground evaluation.

- o Vehicles including snowmobiles may be restricted on big game winter range as needed to meet wildlife needs.

- Visual quality objectives will include Retention, Partial Retention, and Modification and management activities will be designed and implemented to blend with the natural landscape.

Wildlife and Fish:

- Emphasis will be placed on improving wildlife habitats.

- Implementation schedules will be developed for this management area and will be coordinated with other federal and state agencies and grazing associations. They will address the following items:

  1. Management practices, including direct habitat improvement projects and mitigation measures of other resource activities, necessary to provide the desired conditions.

  2. Methods to maintain or improve a diversity of habitats to provide for a variety of wildlife species in addition to the emphasis species.

  3. Management of the Line Creek elk habitat area to improve elk winter range to good or better conditions and allow for other uses to the extent that they do not conflict with elk use.

  4. Utilization of vegetative manipulation techniques to increase the abundance and vigor of plants determined as key elk forage. Winter ranges will be managed to improve the quantity and quality of forage and to provide adequate cover.

Range:

- Noxious weeds will be controlled using an integrated system of control. On those areas where chemicals are used, additional analysis by appropriate NEPA procedures may be needed.

Minerals:

- Geophysical operations may be restricted or prohibited during critical time periods depending on the type of operations and seasonal conditions. An environmental analysis will identify the necessary mitigation measures to minimize adverse impacts. These will be specified in the permit authorizing the activity. Minimal impact techniques may be required. Geophysical activities will not be permitted on the Line Creek elk herd management area of the Beartooth Ranger District during big game rifle season.

Facilities:

- Roads will be routed to minimize loss of wildlife and fish habitat. At the end of their use period, the roads will be obliterated and rehabilitated or "put to bed" for future use. Construction will not be permitted during critical periods for wildlife and fish. New road designs will include provisions to enable restrictions of use such as gates or barricades.

1.5.3 Discussion of Leases

1.5.3.1 Leases and Stipulations

The Phillips Ruby A Federal No. 1-9 proposed exploratory well drilling activities located in Sec 9 T9S R20E (the downhole or target location) are provided for under lease M-60558 issued by the BLM on October 1, 1984. Drilling activities at the surface location in Sec 15 T9S R20E are provided for by lease M-58856, issued by the BLM on March 1, 1984. Phillips is the lessee of record on both leases. Lease stipulations applicable to these lease areas are summarized below. Appendix A, Lease Stipulations, provides more detailed information regarding lease stipulations pertaining to the drilling proposal.

1. Stipulations For Lands Under Jurisdiction of Department of Agriculture - Form 3109-3. (Requires compliance with Department of Agriculture rules and regulations on National Forest lands).

2. BLM Stipulations - Form MT-3109-3. (No Surface Occupancy Stipulation). No surface occupancy is allowed on designated segments of the lease for oil and gas exploration and development activities.

   - Surface Occupancy Restriction - Timing. This stipulation provides for protection of wintering elk on key high-use elk winter range during oil and gas exploration, drilling, and development activities.

- o Activity Coordination Stipulation. This stipulation provides for protection of lands within key elk summer range. The stipulation requires that special conditions such as timing of surface disturbance activities to avoid key summer range may be required prior to approval and commencement of any operations on the designated segments of the lease.

3. BLM Stipulations - Form MT-3109-12. (Oil and Gas Lease Stipulations for Lands Under Jurisdiction of Department of Agriculture). This stipulation provides for protection of cultural and paleontological resources, endangered or threatened species, aesthetics, erosion control measures, and for controlled or limited surface use.

1.5.3.2 Previous NEPA Documents and Decisions to Lease

On October 10, 1978, the Beartooth "Face" Land Management Plan (LMP) and EIS were filed with the Council on Environmental Quality and made available to the public. Public participation in the development of the Beartooth Face EIS began in June 1975. Public meetings were held and a DEIS was made available to the public.

Approximately 600 agencies, organizations, groups, elected officials, and individuals received copies of the DEIS. A total of 111 responses were received. The decision to implement this LMP was not appealed by the public.

On November 26, 1980, the Beartooth "Plateau" EIS/Record of Decision (ROD) was filed with the Council on Environmental Quality and made available to the public. Public participation for the development of the Beartooth Plateau EIS began in the mid-1970's.

Public meetings were held and a DEIS was made available to the public on July 22, 1976. A total of 546 responses were received to the DEIS. The decision to implement this LMP as "interim direction" until the Custer Forest Plan was completed and was not appealed.

Both the "Face" and "Plateau" Land Management Plans and EIS's recommended leasing of certain National Forest System lands within the boundary of the areas covered by this DEIS. Stipulations by area were disclosed for public review and comment.

The BLM issued Phillips lease M-58856 (effective date March 1, 1984), following the Forest Service leasing recommendation based on the Beartooth "Face" Land Management Plan and EIS. Phillips lease M-60558 was issued by the BLM (effective date October 1, 1984) following the Forest Service leasing recommendation based on the Beartooth "Plateau" Land Management Plan and EIS.

1.5.3.3 Forest Land and Resource Management Plan/Environmental Impact Statement

In 1987, the Custer National Forest prepared a Land and Resource Management Plan (or Forest Plan) and associated EIS (LRMP/EIS) in response to the National Forest Management Act of 1976. This "Plan" determined which lands on the Custer National Forest, including the Beartooth Ranger District, would be available for leasing. The Forest sent out 1,200 letters to inform and involve the public. These letters summarized the management guidance contained in the various Land Management Plans developed in the late 1970's, including the leasing recommendations in the Beartooth "Face" and "Plateau" plans. Public meetings were held and a DEIS was provided for public comment on April 19, 1986. Public comments received on the Beartooth Ranger District portion numbered 281. The "Final" Custer National Forest Plan identifies the areas as available for leasing and identifies appropriate stipulations.

The Custer National Forest LRMP/EIS, as an integrated management plan, evaluated various alternatives for managing the Forest as a whole for the next 10 to 15 years. Benchmark analyses were used to determine the "window of capability" for various resource potentials on the Forest, including oil and gas. These benchmark analyses determined the maximum and minimum resource outputs or range of outputs for each resource. Some of the alternatives that were considered include a continuation of current management; emphasize commodity outputs; emphasize non-market outputs; maximize wilderness designation; and an alternative that reflected the 1980 Resource Planning Act (RPA)

program. Other alternatives were designed to analyze various mixes and levels of resource outputs.

Although the Custer National Forest LRMP/EIS did not result in a leasing decision for specific areas, the LRMP/EIS did analyze and disclose the effects of leasing and subsequent exploration and development. For the area involved, alternatives were evaluated that included no oil and gas leasing, leasing with No Surface Occupancy, leasing with timing restrictions, and leasing with minimal stipulations to protect the basic soil, air, and water resources.

1.5.3.3.1 Record of Decision

The Custer National Forest LRMP/EIS replaced the previous resource management plans subject to existing rights, contracts and leases (page 4, ROD). Exploration and development of energy and mineral resources were one of five key issues used in selecting the "Forest Plan" from the various alternatives. Although the ROD did not specifically make the leasing decision, it identified lands available for leasing with surface occupancy stipulations, available for leasing with "No Surface Occupancy" stipulations, and areas where leasing was not compatible with long-term management goals of the Custer National Forest LRMP/EIS (page 10, ROD).

1.5.3.3.2 Lease Consistency with Forest Plan

Under the Custer National Forest LRMP/EIS, the lands within lease M-60558 (target location in Section 9 T9S R20E) would be leased with similar stipulations as those identified by the Unit Plan and contained in the lease. This lease is located in Management Area "D" of the Custer National Forest LRMP/EIS.

The proposed drill site proposal and other potential development locations (see Appendix B) are located in Management Area C. If these lands were to be leased under the Custer National Forest LRMP/EIS standards and guidelines, a "No Surface Occupancy" stipulation would be applied unless the site-specific analysis undertaken to support the leasing decision showed that the management goal for that area could be met with less restrictive stipulations.

The Custer National Forest LRMP/EIS (page 4, ROD) states that site-specific analyses will be performed at the project level. This DEIS provides that analysis in order for Phillips to exercise the lease rights that pre-date the Custer National Forest LRMP/EIS.

1.5.4 Unit Area Stipulations

Phillips has formed a federal unit known as the Ruby Unit. This Unit was approved by the BLM on May 31, 1989. Operation of this 13,660 acre tract of land is authorized by a Unit Agreement between lease holders within the Unit Area. As per terms of the Unit Agreement, Phillips is designated the Unit Operator. Assignment of Unit Operator implies that Phillips consents to accept the duties and obligations for discovery, development, and protection of gas and/or oil reserves within the Unit Area, should they occur.

1.5.5 Field Development Scenario

Phillips and the IDT, under the direction of the FS and BLM, have reviewed the best available geologic literature, data, and concepts and have formulated a field development scenario for inclusion in this analysis. This future development scenario considers seismic interpretations and established well control data from oil/gas fields to the northeast and southeast of the Ruby A Federal No. 1-9 prospect. The information was developed to provide an estimate of the future actions and effects that could potentially result from developing this prospect. The discussion explores foreseeable impacts that could occur from exploration and development activities and the appropriate mitigation measures that would likely be required. This disclosure of the field development scenario is contained in Appendix B of this EIS.

1.6 AUTHORIZING ACTIONS

The federal, state, county, and local actions required to implement the Phillips exploratory drilling proposal would generally be the same regardless of the alternative selected. These actions are listed in Table 1-1.

1.7 ISSUES AND CONCERNS

Public issues and comments regarding the Phillips proposal were solicited for incorporation into this EIS through the scoping process. Scoping for the original Ruby A Federal well proposal on the Line Creek Plateau consisted of preparation and submittal of a scoping letter to interested individuals, organizations, and companies. The scoping letter contained the location and submittal date of the APD; described the action to be analyzed; identified preliminary land and resource management issues, concerns and opportunities; and outlined timing needs for public involvement. In addition, the letter provided information on how groups/individuals/agencies could become involved in the analysis process. Scoping letters were mailed to people and organizations who showed an interest in this specific proposal and to those people and organizations who showed an interest in similar projects in the past. Interested groups/individuals were requested to comment by the scoping period deadline of May 2, 1988. In addition to the scoping letter, scoping meetings and open house information sessions were held in Red Lodge and Billings, Montana, and were conducted by the FS and BLM. Additional scoping was accomplished through the news media (newspapers, television, and radio). The revised drilling proposal was submitted to the FS and BLM on August 3, 1988. The FS and BLM determined that a public meeting conducted by Phillips, combined with news releases to the local news media, would adequately inform the public on changes in the drilling proposal. Detailed discussion of public participation and public involvement for this project is presented in Chapter 6, Consultation and Coordination.

Social and environmental issues and concerns of importance identified during scoping for the Phillips proposal include the following:

1. There are concerns that drilling of this well and possible subsequent full field development in the Ruby Creek drainage and adjacent lands would disrupt significant scenic and wildlife resources important to the tourist based economy of Red Lodge.

2. Dispersed recreation values within the project area, primarily big game hunting during the fall months, could be reduced as a result of drilling activities.

3. There is concern regarding possible adverse impacts to the biological, physical, and aesthetic values of the Greater Yellowstone Area resulting from the drilling proposal.

4. New road construction would be required to access the proposed drill site on lands currently managed by the Custer National Forest as a road closure area.

5. There are concerns regarding the cumulative effects of this drilling action on big game habitat (primarily elk) when considered with on-going activities in the vicinity of the drilling proposal.

6. There is an annual elk migration through the project area. The drilling proposal may disrupt use of historic migration routes.

7. There are management concerns regarding possible impacts to big game spring, fall, and winter range in portions of the leasehold.

8. Concerns exist regarding successful road reclamation on steep slopes in the vicinity of the drill site.

9. Concern exists for the cumulative impacts of the drilling proposal relative to other land and resource use activities in the area.

10. Hydrogen sulfide (H_2S) gas could be encountered during the drilling operation. There are concerns for the safety of the drilling crew and the public (primarily recreationists) in the vicinity of the drilling operation.

1.8 OPPORTUNITIES

Opportunities that may be derived from the drilling proposal include the following:

1. The drilling proposal could provide Phillips the opportunity to evaluate lands within their leasehold for hydrocarbon potential.

2. The drilling proposal and related support activities may provide economic benefit to nearby communities.

Table 1-1. Federal, State, and County Authorizing Actions.

Agency	Nature of Action
DEPARTMENT OF INTERIOR	
Bureau of Land Management (Miles City District)	Approval of Application for Permit to Drill (APD), Hydrogen Sulfide Contingency Plan, wastewater disposal, Sundry Notices.
	Approval to vent or flare gas during testing.
	Approval to dispose of produced water.
	Unit Area Agreement approval.
	Grant approval of access road survey and design for new construction and prescribed reconstruction of existing roads on BLM-administered lands.
	Issue antiquities permits and permits to excavate and remove archeological resources on BLM-administered lands.
U.S. Fish and Wildlife Service	Review impacts on federally listed or proposed for listing threatened or endangered species of fish, wildlife, and plants.
DEPARTMENT OF AGRICULTURE	
U.S. Forest Service (Custer National Forest)	Issue special-use permits for constructing right-of-ways on FS administered surface.
	Grant approval of access road survey and design on FS administered land.
	Issue timber sale contracts for merchantable timber involved with construction.
	Approve Surface Use Plan of Operation.
ENVIRONMENTAL PROTECTION AGENCY	Issue Resource Conservation and Recovery Permit for treatment, storage, or disposal of hazardous waste.
	Register generators of hazardous waste.
	Permit injection *and disposal* wells.

Table 1-1. Federal, State, and County Authorizing Actions.

Agency	Nature of Action
DEPARTMENT OF THE ARMY	
U.S. Army Corps of Engineers	Issue Section 404 permit(s) for placement of dredged or fill material in waters of the United States or their adjacent and isolated wetlands.
MONTANA BOARD OF OIL AND GAS CONSERVATION	Primary authority for drilling on state and privately held mineral resources.
	Regulate drilling and plugging of wells.
	Regulate directional drilling.
	Provide rules and regulations governing drilling units.
	Permits for blowout prevention and drilling.
	Authority to allow or prohibit flaring or venting of gas.
MONTANA DEPARTMENT OF HIGHWAYS	Access approach permit.
MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION	Groundwater Appropriation permit.
STATE HISTORIC PRESERVATION OFFICER	Antiquities Act compliance.

3. The public would benefit from the use and sales of their mineral resources by generating revenues for the federal treasury.
4. The potential for improving existing Carbon County and private transportation system roads in the proposed access corridor exists through improved maintenance and gravel surfacing.
5. Improved public roads to the Forest boundary could help the FS meet the Forest-wide objective of providing access to the Forest every five miles.
6. The potential exists to improve public access to BLM administered public lands and FS administered National Forest System (NFS) lands through requisition of public right-of-way.

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PROPOSED ACTION AND ALTERNATIVES

Chapter 2

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Chapter 2

CHAPTER 2

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

The Ruby A Federal No. 1-9 exploratory oil/gas drilling proposal (Ruby A Federal Prospect) is located in the northwest quarter of the northwest quarter of Section 15, Township 9 South, Range 20 East (NW1/4 NW1/4 Sec 15 T9S R20E) of the Montana Principle Meridian (MPM). The project area is about 12 miles south of Red Lodge and 16 miles southwest of Belfry, Montana, as shown on Exhibit 1-1 and 1-2, and 14 miles west of Montana State Highway 72.

Phillips' drilling proposal specifically involves construction of a 1.7-acre drill pad, upgrade and reconstruction of 8.8 miles of existing unimproved road; construction of 0.3 miles of new access road, directional drilling of a single exploration well, testing of hydrocarbon bearing formations, and reclamation of the drill site and access road if drilling is non-productive. The proposed action and alternatives are shown on Exhibits 2-1 and 2-2 and more specifically described in the following section.

The Phillips Ruby A Federal Prospect is not the first exploratory drilling attempt within the analysis area. Several test holes have been drilled near the Ruby A Federal Prospect along the east edge of the Beartooth and Line Creek Plateaus in Montana and Wyoming. The most notable of these was the Amoco Unit #1A located five miles north-northwest of the Ruby A Federal site in the SW1/4 SE1/4 of Sec 19 T8S R20E. Drilling activities on this prospect began in September 1986. After reaching a total depth of 14,012 feet, the well was temporarily plugged and abandoned in April 1987. The borehole was re-entered in September 1987 with a sidetrack hole. The sidetrack hole was plugged and abandoned in April 1988 after reaching a total depth of 15,800 feet. Previous drilling activity closest to the Ruby A Federal location is the Amoco #1B.N. well located one-half mile northeast in the NE1/4 NW1/4 of Sec 11 T9S R20E. This drilling attempt was plugged and abandoned in October 1976 after reaching a total depth of 14,848 feet. A test hole of critical importance to the Ruby A Federal Prospect is the Impel 5-24 Ohara located less than four miles to the south in the SE1/4 NW1/4 of Sec 24 T58N R103W, Park County, Wyoming. This drilling attempt recovered oil on a DST (drill stem test) of the Phosphoria Formation. This well was later re-completed in the Frontier Formation. This well is believed to be located on the south plunge of the Ruby structure. Other drilling attempts in the proximity of the Ruby A Federal Prospect are shown on Exhibit 2-3.

2.2 DESCRIPTION OF ALTERNATIVES

2.2.1 Introduction

This Environmental Impact Statement (EIS) analyzes three separate alternatives: Alternative A, the proposed action, which involves drilling the exploratory well at the Ruby Creek site; Alternative B, which involves drilling at the Gold Creek site; and the "No Action" Alternative, which would involve denial of Phillips' Application for Permit to Drill (APD). These alternatives are shown in Exhibits 2-1 and 2-2.

2.2.2 Alternative A - Proposed Action

Alternative A is Phillips' preferred drill site and access route. The drill site is located on a saddle of a small ridge that extends southeast from the midslope of the Line Creek Plateau. The saddle is roughly a 250-foot by 300-foot sagebrush-scrub area that slopes to the northeast through southeast. Slope gradients increase from ten percent on the saddle to 40 to 50 percent below the north, east, and south edges of the saddle. Although the drill site occurs within the limber pine woodland cover type, approximately half of the drill site is covered by a mixed grass vegetative cover, while the other half is dominated by big sagebrush.

Access to Alternative A is provided by paved Montana State Highway 72 south from Belfry, Montana for about two miles to the intersection with the Grove Creek County road. From this point, access proceeds westerly along the Carbon County road for five miles to its intersection with an existing unimproved two-track road that traverse a mix of BLM-administered land and land under private ownership. From this point, the access road proceeds for eight miles to the

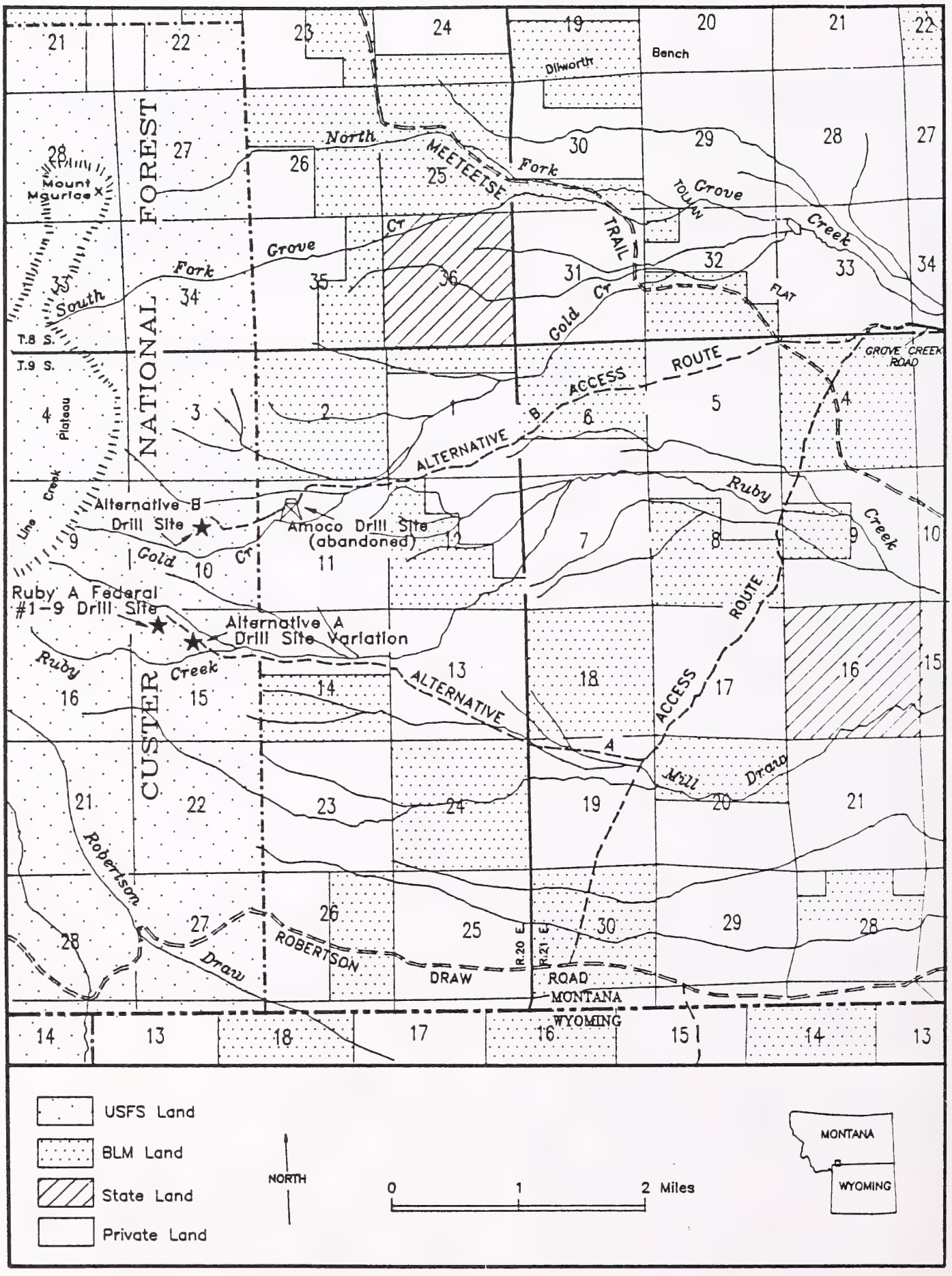

Exhibit 2-1. Project Area of Ruby A Federal No. 1-9 Proposal and Gold Creek Alternative.

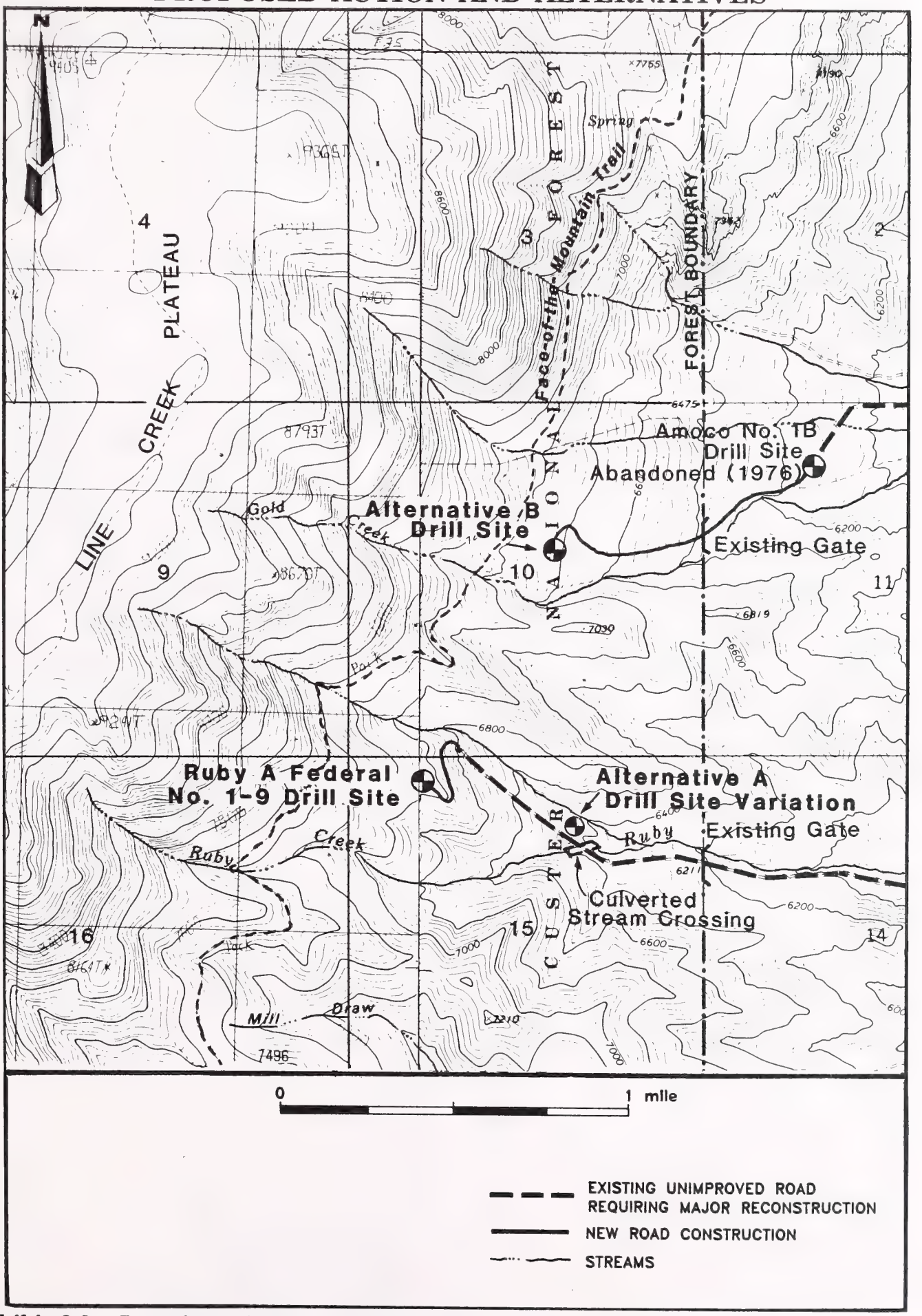

Exhibit 2-2. Location of Ruby A Federal No. 1-9 and Gold Creek Alternative Drill Sites.

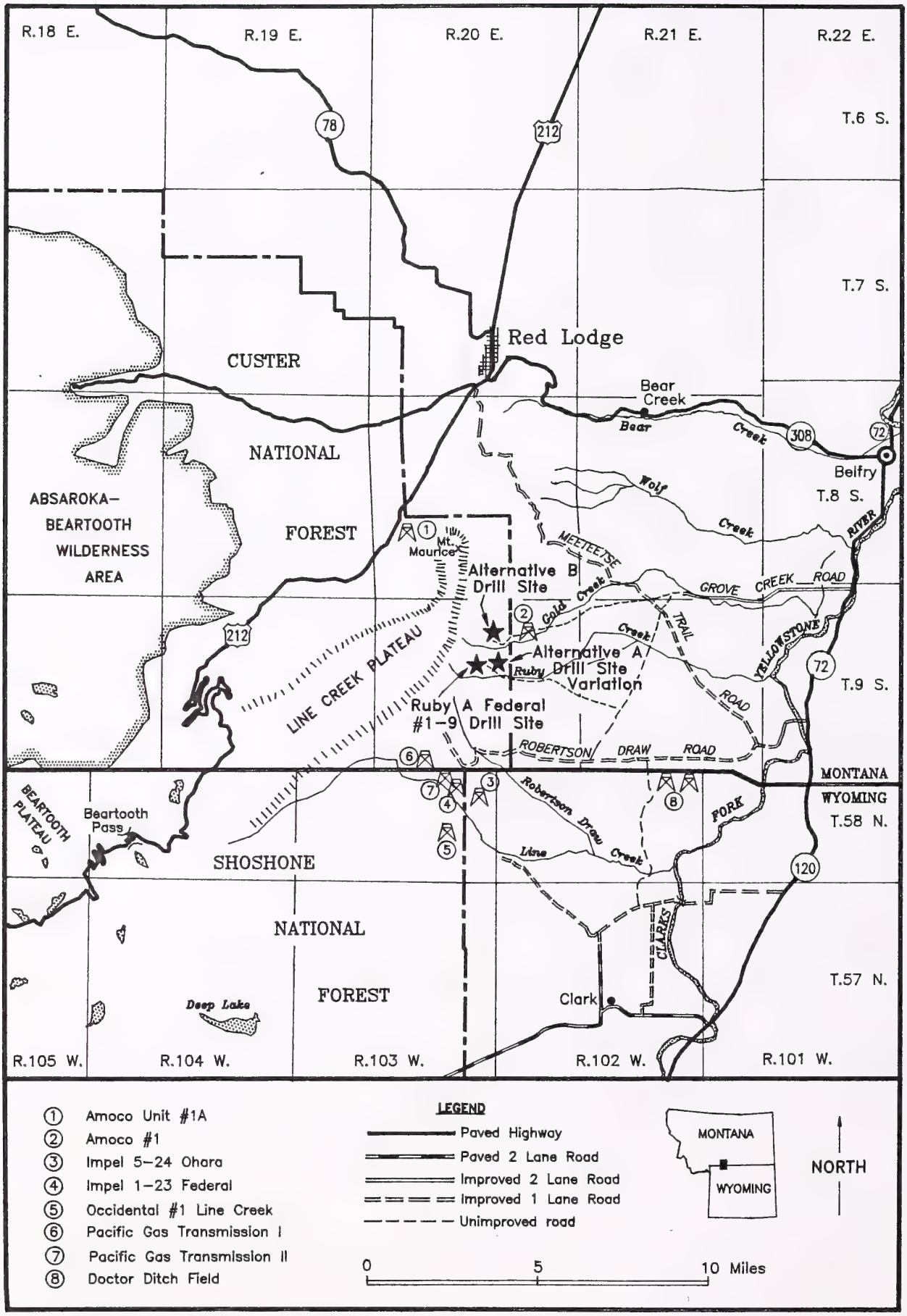

Exhibit 2-3. Other Drilling Attempts in the Vicinity of the Ruby A Federal No. 1-9 Project.

Custer National Forest boundary (Forest boundary) fence. The unimproved two-track road continues into the Forest for an additional 0.8 miles to its terminus. From this point, 0.3 miles of new road construction would be required to access the proposed drill site. Exhibits 1-2, 2-1, and 2-2 show the location of the proposed access route. Total length of existing road improvement would be 8.8 miles of road reconstruction of which 0.8 miles would be on Forest land. Approximately 0.3 miles of new road construction from the terminus of the existing unimproved road to the drill site is proposed on Forest land. Reconstruction of the existing unimproved road would involve disturbing approximately 21.3 acres, assuming a 20-foot wide construction zone. Construction of the 0.3 miles of new road would involve disturbing approximately 1.5 acres assuming a 40-foot construction zone. The total cumulative area of new disturbance including the drill pad (1.7 acres), cut and fill slopes and topsoil pile associated with the drill pad (0.8 acres), new access road construction (1.5 acres), and reconstruction of existing roads (21.3 acres) would be approximately 25.3 acres. Drill pad and access road construction activities are described in the following sections.

2.2.2.1 Access Road Construction

Construction of the access road would commence as soon as authorized by the APD and would take approximately four weeks to complete. All access road construction would be in accordance with an access road design plan submitted by Phillips to the FS and BLM for approval. The primary road access that Phillips would use would be Montana Highway 72 outside the analysis area used in conjunction with county, BLM, private, and FS collector or local roads. FS collector roads in the analysis area average 14 feet in width and are single-lane, two-track roads with no intervisible turnouts. Collector roads are the existing roads in the project area and would require reconstruction to become totally serviceable for exploratory drilling activities.

Following completion and approval of the access road design plans, the access road would be construction-staked on the ground in accordance with FS guidelines. With completion and approval of construction staking, access road construction activities would begin. The first step of access road construction is right-of-way (ROW) clearing.

The access road ROW would first be cleared of all brush and trees before actual construction of the road would begin. Merchantable timber would be disposed of as directed by the FS. Disposal methods would consist of purchase by Phillips and subsequent removal of the timber from Forest lands, decking in designated areas, chipping or burning, or other approved methods compatible with the specific situation. Slash and other debris generated during clearing would be disposed of by burial at designated sites along the access road ROW or by other acceptable methods approved by the FS. The clearing operation would not remove grass or small shrubs.

After completion of clearing, topsoil would be stripped from all areas along the ROW where surface disturbance is necessary and stockpiled in a designated area or areas to prevent loss from erosion or contamination with other excavated materials. All topsoil would be removed in a separate layer from other subsoil materials. The depth of the topsoil materials to be removed and stockpiled are specified in the site-specific reclamation plan presented in Appendix D.

Construction of the access road profile would begin after completion of all clearing and topsoil stripping operations. Construction equipment and techniques utilized by Phillips would include standard cut-and-fill construction methods and construction machinery (e.g., D8 or D9 Caterpillar tractors, scrapers, etc.). To assure that supplies and equipment can be transported to the drill site during all-weather conditions, Phillips plans to gravel the new access road and segments of the existing access roads needing additional surfacing. Quantities of gravel and locations for application would be shown on the approved access road design plan. Water used for dust abatement and controlled compaction purposes during road construction would likely be taken from the Clarks Fork of the Yellowstone River or other State of Montana approved surface water source(s).

The proposed new access road and the upper segment of the existing two track road on the Forest are located on terrain having site occupancy limiting factors that would prohibit some conventional construction techniques. These limiting factors include areas with steep sideslopes and an area adjacent to a live stream, and one stream crossing.

Construction methods that Phillips proposes to utilize to solve the construction problems are as follows:

- Phillips would use minor routing variations to avoid as much of the areas with steep sideslopes as possible during access road design. Where these steep areas could not be avoided, full bench construction and stockpiling of excavated material would be accomplished. The access road design plan would show road segments requiring full bench construction and locations of stockpiling areas.

- Phillips would attempt to place the road on the gentler part of the areas adjacent to live streams and to minimize the extent and magnitude of cuts and fills. Where road construction adjacent to the stream environment is necessary, Phillips would limit the total area of site disturbance.

2.2.2.2 Drill Pad Construction

The drill pad would be constructed from native materials located at the site and would occupy an irregular area approximately 255 feet by 375 feet. The 1.7 acre drill pad would also entail an additional 0.8 acres of cut and fill slopes and topsoil stockpile. Exhibit 2-4 shows the approximate layout of the drill pad and associated facilities. The drill pad would be designed so that construction materials would balance (i.e., cut and fill material would be about the same quantity), while attempting to minimize the total disturbed area. All available topsoil suitable for reclamation would be stripped from the drill pad area and stored adjacent to the drill pad prior to start of actual drill pad construction. Prior to stripping of topsoil, all woody vegetation and debris greater than two inches in diameter would be removed from the drill pad area. No commercial timber is located on the site. After topsoil stripping operations are complete, construction of the drill pad would begin. Construction practices would involve use of standard earthwork construction equipment. Construction of the drill pad and related facilities would require approximately three weeks to complete.

Other features of the drill pad would include construction of a cuttings trench to store drilling cuttings. Drilling would be accomplished by the use of a closed mud system. This system allows for the re-use and conservation of drilling water, minimizing the amount of waste generated by the drilling operation. No reserve pit would be constructed since storage and containment of drilling fluids would not be required with a closed mud system. An impermeable membrane liner would be placed under the drill rig in such a manner that rig wash fluids and precipitation would flow to the cuttings trench. Phillips also plans to line the cuttings trench with an impermeable membrane liner. Sewage would be contained in portable self-contained sanitary units and/or a self-contained sewage system. Sewage would be hauled off-site to a State-approved sanitation facility. Water, for use in conjunction with drilling, would be obtained from a water well drilled on the drill pad. If an alternate water well source becomes necessary because of inability to locate water at the drill pad location, a water well would be drilled on the alluvial bottomlands below the drill site. Water would be hauled to the drill site by truck if the water well is drilled at this off-drill pad location. Phillips anticipates the need for approximately 10,000 barrels (420,000 gallons) of water in drilling the Ruby A Federal Prospect. A groundwater appropriation permit would be acquired from the Montana Department of Natural Resources and Conservation for the groundwater used in conjunction with drilling.

2.2.2.3 Exploratory Drilling

Once the drill pad and access road construction and reconstruction activities are complete, Phillips would begin the exploratory drilling phase of the project. A drilling rig would be transported to the drill pad by truck and erected on-site. The Phillips proposal would require transport of approximately 80 truckloads of drilling related equipment and materials to facilitate the drilling operation. Total rig-up activities would take from seven to ten days to complete. A typical schematic of drilling layout is shown on Exhibit 2-5.

The Ruby A Federal Prospect would be directionally drilled from the drill pad in the NW1/4 NW1/4 of Sec 15 T9S R20E to a bottomhole location approximately 3,700 feet to the northwest in the SW1/4 SE1/4 of Sec 9 T9S R20E. Phillips proposes to directionally drill the Ruby Federal Prospect to a total depth of 12,520 feet (11,600 feet true vertical depth) in the Ordovician Bighorn Dolomite. Primary objectives are the Cretaceous Frontier

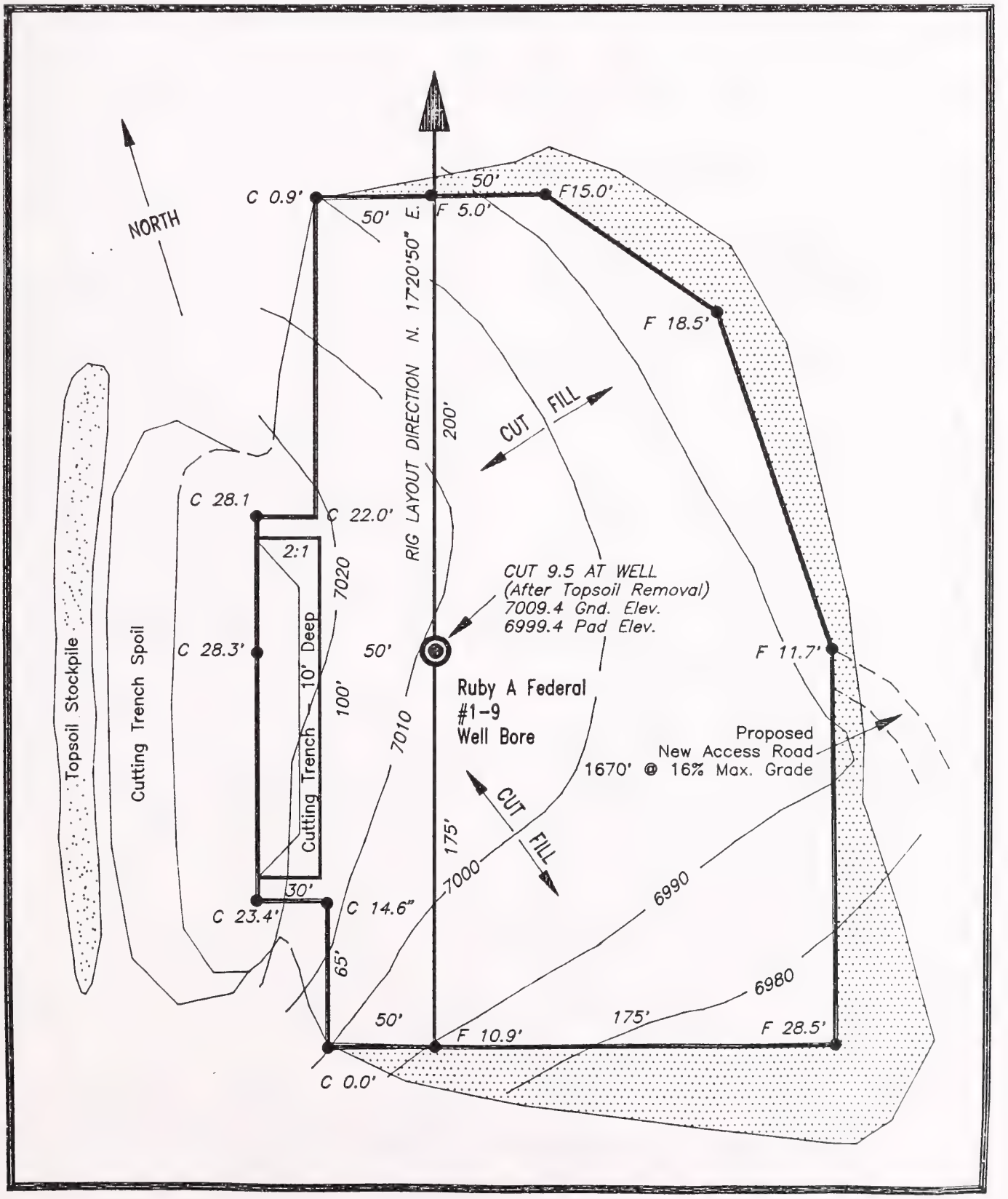

Exhibit 2-4. Engineering Design for the Ruby A Federal No. 1-9 Drill Pad.

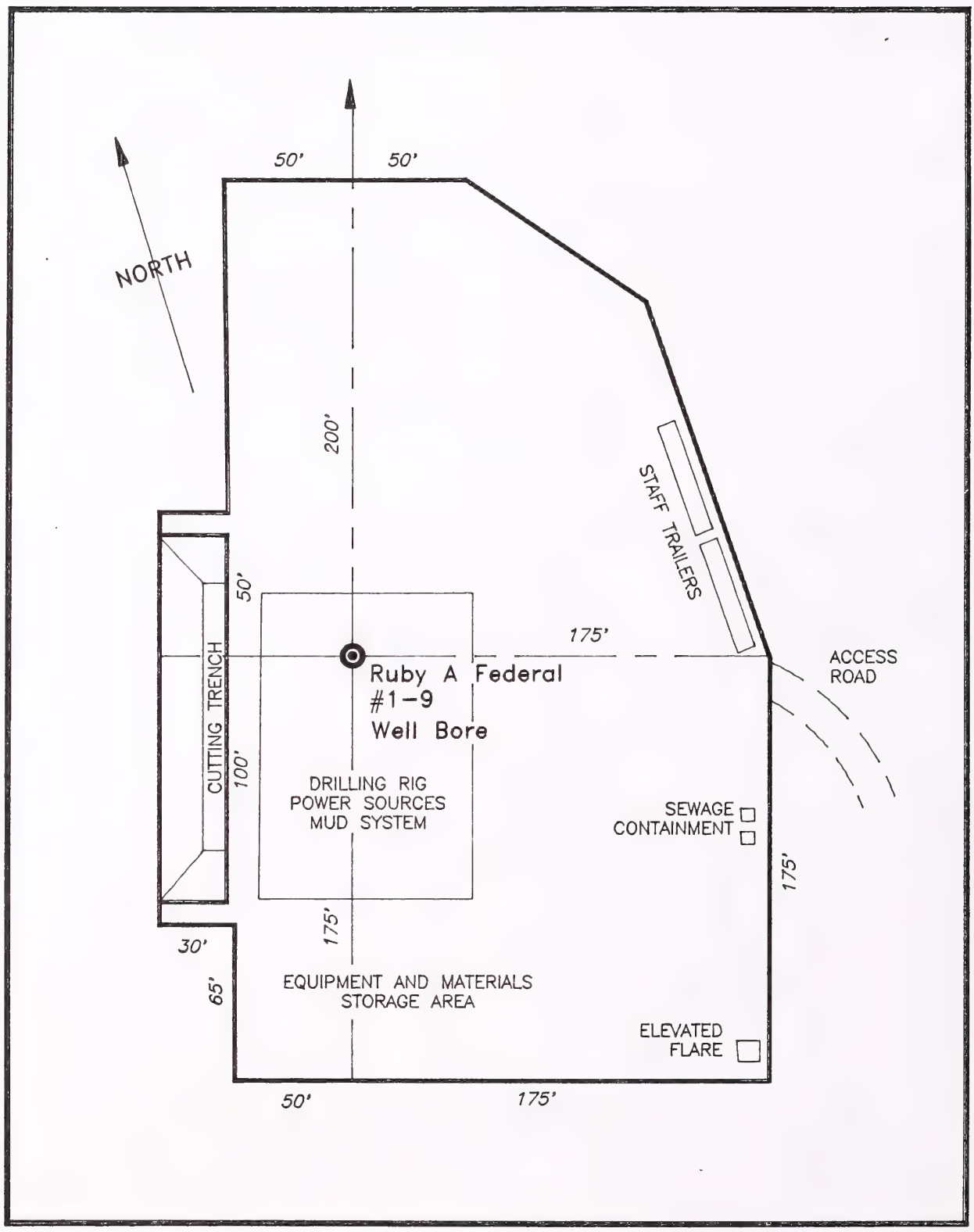

Exhibit 2-5. Schematic of Drill Pad Layout for the Ruby A Federal No. 1-9 Drill Pad.

Sandstone, Permian Phosphoria Formation, and Pennsylvanian Tensleep Sandstone. Other objectives include the Cretaceous Dakota Sandstone, Mississippian Madison Limestone, and Ordovician Bighorn Dolomite. These formations have combined to produce over 500 million barrels of oil at the Elk Basin Field, located 17 miles to the southeast of the Ruby A Federal Prospect. The targeted structure is a north-south trending compressional feature identified in the subsurface using seismic data that was integrated with limited well control. A structural cross section of the Ruby A Federal Prospect is shown on Exhibit 2-6.

As drilling begins and the wellbore progressively deepens, steel casing would be installed in the wellbore and cemented in place to (1) prevent the sides of the wellbore from collapsing, (2) protect against abnormal pressure conditions that may exist at greater depths, and (3) protect freshwater aquifers and other mineral bearing formations. Potential hydrocarbon producing formations would be evaluated during the drilling program by utilizing various well testing methods and techniques. The muds used to drill the well would be cleaned and recycled through a closed mud system. The mud products that would be used are required by federal and state law to be environmentally safe and approved by the BLM.

Phillips proposes to start all construction activities as soon as possible following APD approval. Drilling activities would begin as soon as construction activities are completed. Total drilling and testing time is expected to be about 150 days. A multiple season drilling program is possible if the drilling program continues into critical elk use periods in the fall and early winter. Drilling could continue past October 14 (the site occupancy date authorized by lease stipulation MT-3109-3) if the FS and BLM, in consultation with the Montana Department of Fish, Wildlife, and Parks (MDFWP) determined that continuing operations would not constitute an impact to elk.

If a determination is made by the FS and BLM that elk are not being impacted, Phillips would request a waiver to continue operations, particularly if the drilling program is close to total depth (TD). Drilling operations would be conducted continuously 24 hours a day, seven days a week during the drilling program. If drilling were halted prior to completion, Phillips would take necessary measures to shut the rig operations down and stack the drill rig for the winter. If feasible (i.e., suitable arrangements could be made with the drill rig contractor), the rig derrick would be lowered and the drill rig secured on the drill pad. If not, the rig would be moved off-Forest and stacked on private land near the middle of Sec 13 T9S R20E. About one acre of land would be needed to store the rig.

2.2.2.4 Site Restoration and Abandonment

Phillips proposes to completely reclaim the drill site and new access road on FS and BLM land in the event drilling is non-productive. A comprehensive reclamation plan describing prescribed reclamation measures to be used on both drill site alternatives and access roads is presented in Appendix D. Reclamation measures proposed by Phillips are summarized as follows:

1. Complete cleanup of the drill site area.
2. Restoration of the drill site to the ground contour that existed prior to construction.
3. Replacement of topsoil over all disturbed areas.
4. Seeding of reclaimed areas with the seed mixture prescribed in the approved site reclamation plan.

The water well drilled on-site would likely be abandoned unless the FS requested that it be left in place for other uses. If production is encountered, the water well would likely be used for future drilling and production activities. Reclamation procedures followed in reclaiming the drill site would also be utilized in reclaiming the access road. Access road reclamation would begin at the drill site and follow the access road to the present road closure point at the Forest boundary. Reclamation on disturbed lands administered by the BLM would be as specified by the BLM. Reclamation on fee lands would be as per negotiated agreement with the private land owners along the access route.

If commercial quantities of oil were discovered, the drill site and access road would not be reclaimed as described above, but would be stabilized to reduce the potential for erosion by methods described in Appendix D, Erosion Control, Revegetation, and Rehabi-

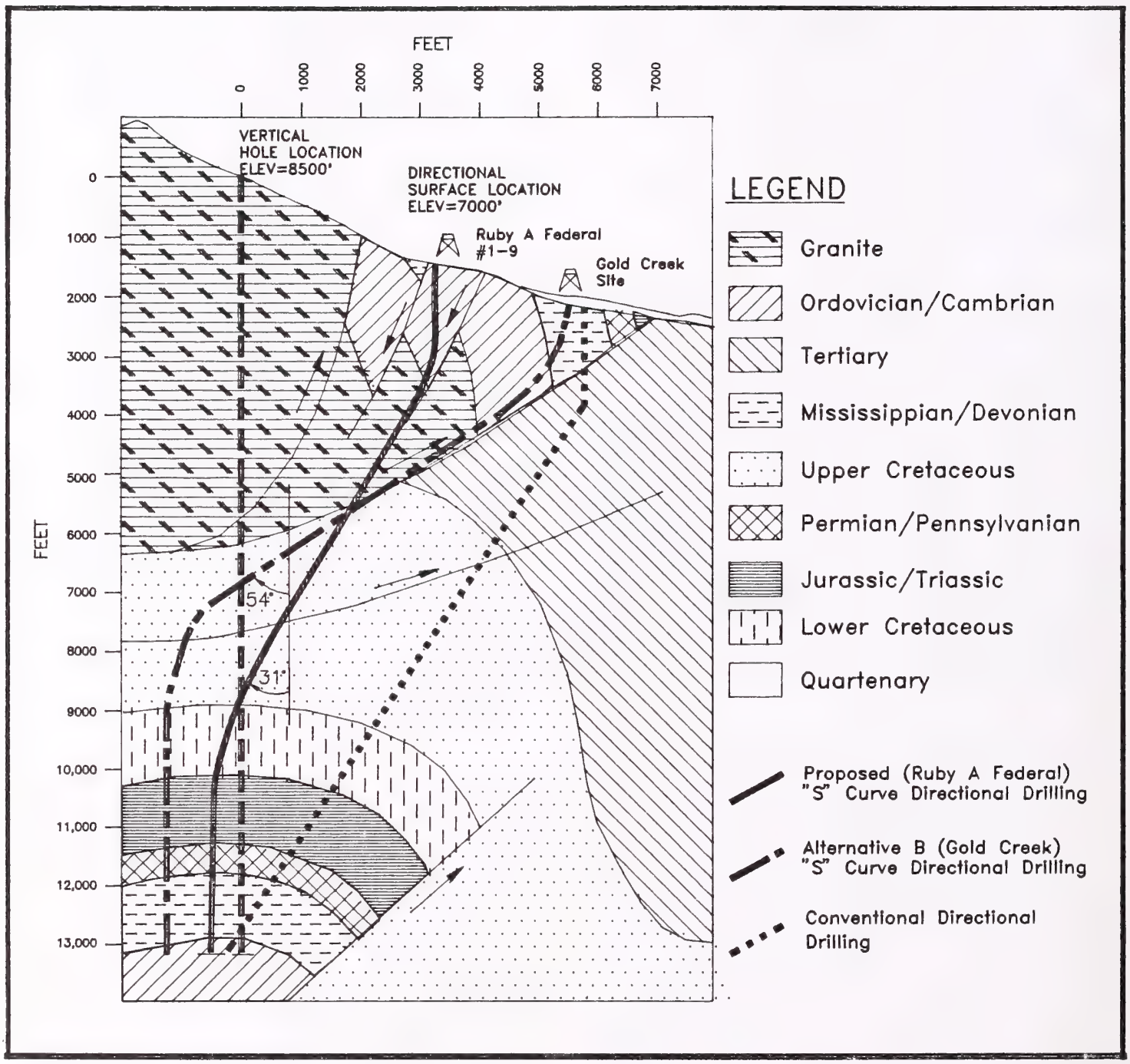

Exhibit 2-6. Geologic Structure Cross-section of the Ruby A Federal No. 1-9 Drill Site, Gold Creek Drill Site, and Target Location.

litation Plan. The drill pad would be left in place for additional well drilling activities if authorized by the FS and BLM as described in the field development scenario proposed by Phillips (Appendix B). Segments of the drill pad not needed for production operations would be regraded, topsoiled, and revegetated. Cut and fill slopes associated with drill pad construction would be revegetated with a seed mixture specified in the comprehensive reclamation plan. The drill pad and wellhead would be fenced to preclude public access and wildlife entry. The access road to the drill pad and well head would remain in place for maintenance and production development purposes. Disturbed cut and fill slopes associated with road construction would be revegetated and stabilized as described in Appendix D.

The decision to be made by Phillips regarding production from this one exploratory well is related to the amount/type of production encountered and the economic feasibility of one well production. If the decision is made to produce this well, there would be an interim period of no activity at the drill site when Phillips is attempting to obtain a permit to produce from this one exploratory well. If the decision is made by Phillips to shut-in this well and permit a confirmation well or wells, the FS and BLM would conduct an in-depth analysis of field development. During this interim time period (estimated 2 to 3 years), the drill site, access road, and well head facilities would be monitored by Phillips as specified by the FS and BLM as discussed in Appendix D. Monitoring would be necessary to maintain site stabilization measures utilized on disturbed areas and assure compliance with safety equipment and standards at the well head.

2.2.2.5 Alternative A Access Route Variations

To assist in the FS and BLM decision-making process, three access route variations to the proposed drill site (Alternative A) were considered in the analysis of this alternative. The purpose of the analysis is to provide a contrast in management opportunities and environmental impacts that would assist the agencies in the decision-making process. These variations are shown on Exhibit 3-2 and discussed in detail in the Transportation sections of Chapter 3 and Chapter 4. These variations are summarized in the following sections.

2.2.2.5.1 Proposed Action (Variation A1)

This variation is Phillips' proposed access route to the Ruby Creek drill site described previously.

2.2.2.5.2 Meeteetse Trail-Robertson Draw Access Route (Variation A2)

The Meeteetse Trail - Robertson Draw Access Route variation follows the county improved Grove Creek Road to its terminus for 5.0 miles from Montana Highway 72. From the end of the Grove Creek Road, this access route follows unimproved two-track roads for approximately 1.1 miles to the Meeteetse Trail road and then follows this road for approximately 5.1 miles to its convergence with the Robertson Draw Road. From this point the access route follows the Robertson Draw Road for 5.7 miles to a point where an unimproved two-track road heads north toward Mill Draw. The access route follows this two-track road to Mill Draw where it converges with Phillips' proposed access route. From this point, this access route variation is identical to Phillips' proposed access route. This variation would involve 5.0 miles of the improved county Grove Creek Road requiring no reconstruction, 10.8 miles of improved county road (Meeteetse Trail and Robertson Draw Road) requiring minor reconstruction, 6.8 miles of unimproved two-track road requiring major reconstruction, and 0.3 miles of new road construction.

2.2.2.5.3 Southern Access-Robertson Draw Access Route (Variation A3)

The Southern Access - Robertson Draw Access Route variation would originate from Montana Highway 72 approximately 2.2 miles north of the Wyoming border. The access route follows a county road for 1.5 miles across the Clarks Fork to the Robertson Draw Road. From this point access to the drill site would be identical to the Meeteetse Trail - Robertson Draw Access Route (Variation A2) described previously. This variation would involve 1.5 miles of county improved road requiring no reconstruction, reconstruction or new construction of the bridge over the Clarks Fork, 5.7 miles of improved county road (Robertson Draw Road) requiring minor

reconstruction, 5.7 miles of unimproved two-track road requiring major reconstruction, and 0.3 miles of new road construction.

An engineering analysis was undertaken to determine the economic and technical feasibility of utilizing the existing bridge crossing of the Clarks Fork. The purpose of the analysis was to evaluate the adequacy of the bridge over the Clarks Fork for the Robertson Draw route. Appendix C presents the details of the analysis. Findings and conclusions of the analysis included the following:

- The existing steel truss bridge is generally in good condition but will not carry anticipated loads associated with drilling operations without modifications. The existing bridge is currently rated at a maximum load limit of 8 tons. A load limit of 50 tons would be required to facilitate the heavy drill rig and support mobilization loads.

- A river ford and a temporary pontoon type bridge were rejected as viable alternatives due to environmental and timing constraints.

- Temporarily modifying the existing bridge is a viable alternative. Modifying the existing bridge would cost approximately $166,000.

- Construction of a new bridge is a viable alternative. The estimated cost of constructing a new bridge is approximately $470,000.

2.2.2.5.4 Clark Wyoming Access Route (Variation A4)

The Clark Wyoming access route variation originates from Wyoming Highway 120 approximately 8.6 miles south of the Montana border. From this point the access route follows an improved county road for approximately 2.0 miles towards Clark, Wyoming, to an intersection with county road 8WC where the route turns north along this road for 2.4 miles to the intersection with county road 8VC. The access route follows this road west for approximately 0.5 miles to an intersection with a graded dirt road heading north to the Joanne Ranch. The access route heads north on this route for 6.1 miles along unimproved two-track roads to the Robertson Draw Road where this access route converges with Variations A2 and A3 and then follows Variation A2 and A3 routes to the drill site. This variation would involve 7.6 miles of county improved road requiring no reconstruction, 10.1 miles of unimproved two-track road requiring major reconstruction, and 0.3 miles of new road construction.

2.2.2.6 Alternative A Drill Site Variation

An alternative drill site location was identified during the public review of the DEIS that involved drilling the Ruby A Federal No. 1-9 Exploratory Oil/Gas Well from a drill site location immediately east of the Alternative A drill site in Ruby Creek. The drill site would be located on the gently sloping surface of the Ruby Creek valley bottom approximately 2,100 feet east of the Alternative A drill site. Surface elevation of the alternative is 6,500 feet or about 500 feet lower in elevation than Alternative A. Exhibit 2-7 shows the approximate layout of the drill pad and associated facilities.

The Alternative A Drill Site Variation was suggested as a viable alternative because it was felt that its displacement from the Alternative A site is minor, while the topographic difference is significant, and it is important in allowing the FS to modify activities to conform to management goals of the area. It was further suggested that the drill site variation would contribute to the following goals:

1. *The variation is removed from wildlife corridor and gathering areas.*

2. *Significantly less visual to moving and stationary wildlife.*

3. *Less visual to humans from all points of view.*

4. *Probably less intrusive from noise and lights.*

5. *Removed from the Face-of-the-Mountain Trail use area.*

6. *Eliminates new road construction over steep ground.*

7. *Requires less site disruption for drill rig.*

8. *Site easier to reclaim.*

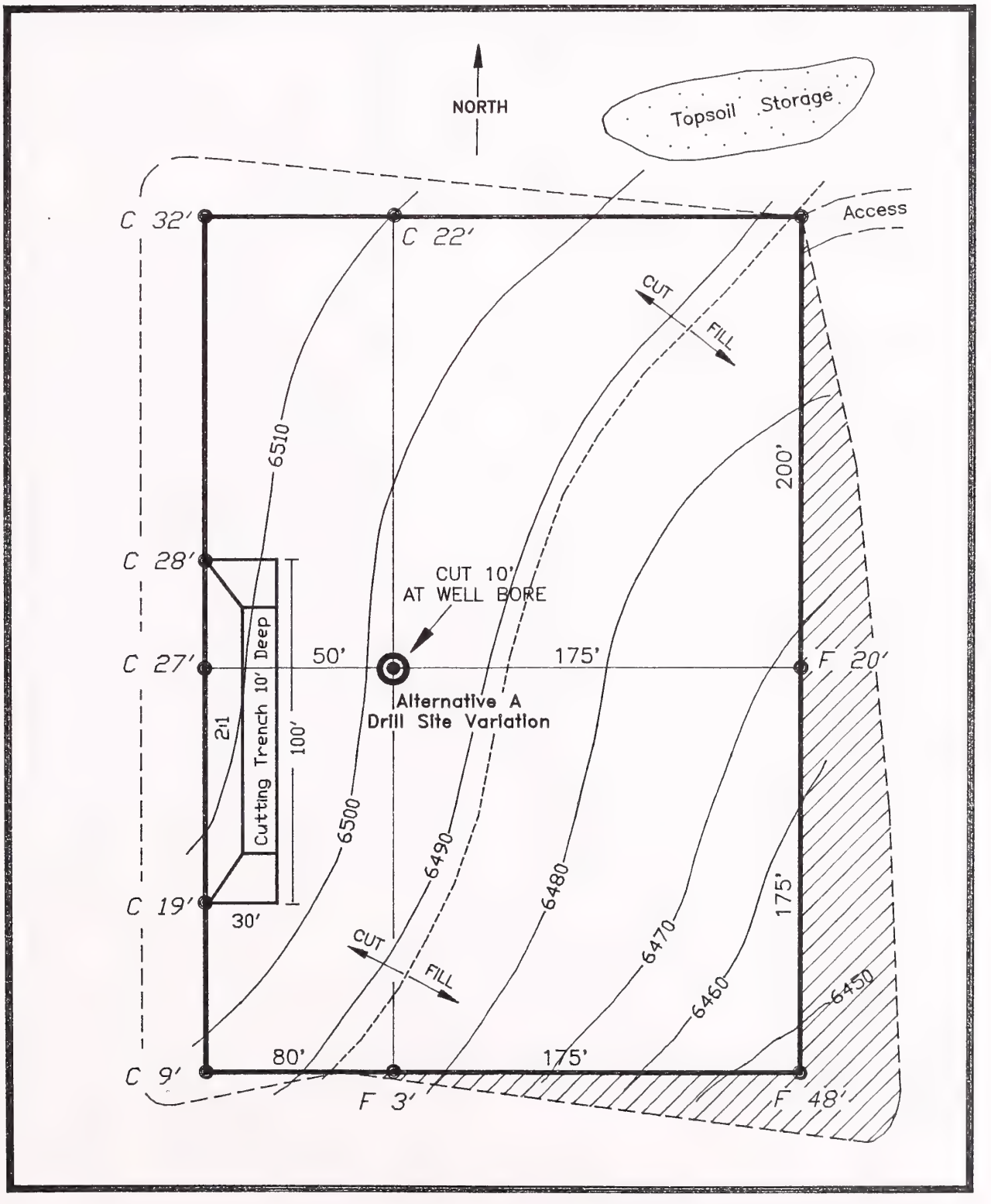

Exhibit 2-7. Engineering Design for the Alternative A Drill Site Variation.

9. *Site easier to service with less disturbance during production.*

Drilling operations and support activities conducted from this drill site would be similar to those discussed under Alternative A with the exception of the access road. There would be approximately 0.3 mile less new road construction required (about 0.15 mile of standard road construction and 0.15 mile of bench cut and end haul construction, all on FS administered land) under the Alternative A Drill Site Variation. Impacts of the Alternative A Drill Site Variation on the various resources elements are provided in Chapter 4, Environmental Consequences.

The technical aspects of the drilling operation would be different than Alternative A. As discussed under Alternative A, Phillips proposes to drill a directional exploratory well. The requirements for drilling a directional well from Alternative A vary considerably from the Alternative A Drill Site Variation because of the difference in ground surface elevation of the drill sites and the distance of the drill sites from the downhole drilling target. The geologic characteristics of the Alternative A Variation site do not facilitate the success of directional drilling as opposed to the Ruby Creek site. The geologic characteristics of the Ruby Creek drill site allow for better control of angle and direction during drilling. Exploratory drilling from the Alternative A Drill Site Variation would have a higher risk of not entering the target geologic structure at a location that allows for full structure characterization. Thus, Phillips' ability to evaluate the structure of interest would be reduced. A comparison of the technical aspects of drilling the initial exploratory well at the Alternative A drill site in Ruby Creek and from the Alternative A Drill Site Variation are provided in Appendix G.

2.2.3 Alternative B - Allow Drilling Using a Drill Site and Access Road Location in the Gold Creek Drainage

During the interdisciplinary field review of the drilling proposal, an alternative drill site and access road alternative was identified by Phillips in the Gold Creek drainage (Exhibits 2-2 and 2-3). The alternative, known as the Gold Creek drill site and access road, is located in the SW1/4 NE1/4 of Sec 10 T9S R20E.

The Gold Creek drill site is located at 6,851 feet on a 20 percent slope. The site is covered with large granitic boulders ranging from one foot to about six feet in diameter over 10 to 20 percent of the area. The site is covered with limber pine woodland vegetation cover type with an overstory canopy cover of about 30 percent. The overstory consists of limber pine and Douglas fir.

Alternative B access to the drill site location is provided by the paved Montana State Highway 72 south from Belfry, Montana, for about two miles to the intersection with the Grove Creek County road. From this point, access proceeds westerly along the Carbon County road for five miles to its intersection with an existing unimproved two-track road that traverse BLM-administered land and land under private ownership. From this point, the access road proceeds westerly for 5.3 miles to the plugged and abandoned Amoco Unit #1B.N. drill site. New access road construction to the Gold Creek drill site would begin at the abandoned Amoco drill site. Total length of new road construction would be approximately 0.9 mile, of which 0.5 mile is located on Forest lands. Reconstruction of the existing unimproved road would involve disturbing approximately 12.9 acres assuming a 20-foot wide construction zone. Construction of the 0.9 mile of new road would involve disturbing approximately 4.4 acres assuming a 40-foot construction zone. The total cumulative area of new disturbance including the drill pad (2.2 acres), cut and fill slopes and topsoil pile associated with the drill pad (0.8 acres), new access road construction (4.4 acres), and reconstruction of existing roads (12.9 acres) would be approximately 20.3 acres. Construction and reclamation techniques and drilling procedures would be generally the same as Alternative A, with some variations likely occurring due to the different location of existing access and the new access road, the occurrence of large boulders, and the drill pad layout. Exhibit 2-8 shows the approximate layout of the drill pad and associated facilities.

Phillips prefers the Ruby Creek site (Alternative A) over the Gold Creek site (Alternative B) for the following reasons:

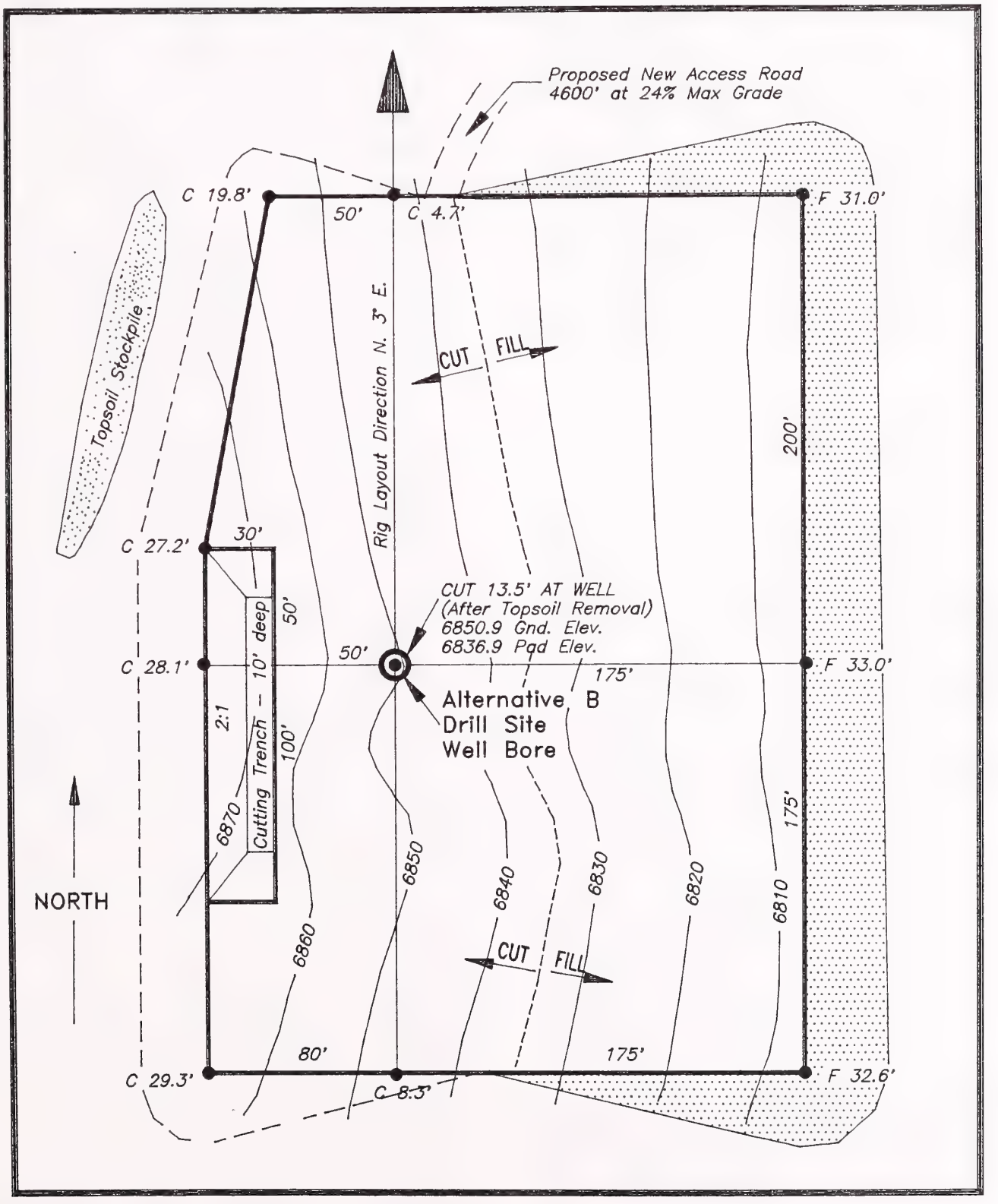

Exhibit 2-8. Engineering Design for the Gold Creek Alternative Drill Pad.

1. The Ruby Creek site offers two important components to the feasibility of the directional drilling program: higher ground surface elevation and closer location to the downhole drilling target. The higher elevation allows the vertical distance needed to achieve changes in angle for the drill bit. The distance from the wellbore to the target allows for a shorter horizontal distance, which also minimizes the angle needed to reach the target. *As previously indicated, drilling and exploratory testing would be most effective from the proposed site. Appendix G presents a comparison of risk of failure, feasibility, and cost associated with each of the three considered drill sites. A schematic of the technical drilling requirements is displayed on Exhibit 2-6. These requirements are summarized as follows:*

   - o The Ruby Creek drill site has a ground surface elevation of 7,009 feet and a 3,700-foot horizontal displacement from the bottomhole location. The Gold Creek site has a surface elevation of 6,851 feet and a 5,500-foot horizontal displacement from the bottomhole location. These vertical and horizontal displacement figures substantially change the drilling angle required to reach the bottomhole location. For the Ruby Creek site, the drilling angle required to reach the bottomhole location is 31 degrees; for the Gold Creek site, the angle is 54 degrees.

   - o As previously mentioned, Phillips proposes to drill a deviated (i.e., directional) exploratory well using specialized directional drilling equipment and techniques. In order to adequately evaluate the potential geologic structures, Phillips needs to enter the zones of interest vertically at the highest portion of the structure. Entering the structures vertically is accomplished by drilling a sigmoid or "S"-shaped curve as shown on Exhibit 2-6. The ability to drill directionally and enter the zones vertically is extremely important in obtaining reliable information regarding the subsurface structures.

   - o Drilling the "S"-shaped curve is difficult. Experts in directional drilling (both Phillips personnel and drilling contractors experienced with directional drilling) agree that directional drilling an exploratory well at 54 degrees, as required by the Gold Creek site, is stretching the technical limits of current drilling abilities. Even drilling a 31-degree exploratory well for the Ruby Creek site is a high risk prospect. The Gold Creek site is an unacceptably high risk and virtually precludes Phillips' ability to evaluate the zones of interest during an exploratory test.

   - o If the Ruby Creek site were drilled and hydrocarbons encountered, Gold Creek would be an acceptable site to drill the confirmation well or to place a development well. Development phase wells are drilled using the standard directional methods of one gradual curve to reach the target rather than the "S"-shaped curve as shown on Exhibit 2-6. This can be done at the development phase because the exploratory well would have pinpointed the zones to be developed. The conventional directional method is considerably more tolerant of large horizontal distance changes than the "S"-shaped curve method.

2. The geologic characteristics of the Gold Creek drill site do not facilitate the success of directional drilling as opposed to the Ruby Creek site. The geologic characteristics of the Ruby Creek drill site allow for better control of angle and direction during drilling. This is due to faults in bedding planes running northeast-southwest along the east face of the Line Creek Plateau. The Ruby Creek site is west of the fault, and the Gold Creek site is east of this fault. Considering the folding of subsurface formations and the angle changes needed to achieve an "S"-shaped curve, the Ruby Creek site would be a technically easier site from which to drill.

3. Phillips has quantified the risks and additional cost of drilling from the Gold Creek site in Appendix G. Drilling from this site would be more difficult and take longer. Due to the low angle at which the wellbore would intersect the fault, it could become extremely difficult if not impossible to drill across the fault. It is

preferred to cross faults at as high an angle as possible. The higher drilling angle combined with two turns in the "S"-shaped curve could result in: 1) the drill pipe frequently getting stuck, thus increasing drilling time and costs; 2) increased costs in well completion and production operations; or 3) failure of the project.

2.2.4 No Action Alternative - Denial of the Phillips APD

Section 1502.14(d) of the National Environmental Policy Act (NEPA) requires that the alternatives analysis in an EIS include the alternative of no action. "No Action" would mean the Phillips application to drill the proposed exploratory well (i.e., to test the targeted geologic structures) would be denied.

An oil and gas lease grants the lessee the "right and privilege to drill for, mine, extract, remove and dispose of all oil and gas deposits" in the leased lands, subject to the terms and conditions incorporated in the lease (Form 3110-2). Because the Secretary of the Interior has the authority and responsibility to protect the environment within federal oil and gas leases, restrictions are imposed on the lease terms.

The Phillips' oil and gas leases (M-60558 and M-58856) contain various stipulations concerning surface disturbance, surface occupancy and limited surface use. In addition, the lease stipulations provide that the Department of the Interior may impose "such reasonable conditions, not inconsistent with the purposes for which (the) lease is issued, as the (BLM) may require to protect the surface of the leased lands and the environment."

Provisions in the lease (lease stipulation MT-3109-12, Endangered or Threatened Species) that expressly provide Secretarial authority to deny or restrict APD development in whole or in part would relate to a jeopardy opinion being rendered by the U.S. Fish and Wildlife Service regarding the prospect:

- o Endangered or threatened species or habitats of plants or animals that are listed or proposed for listing (e.g., grizzly bear). If the U.S. Fish and Wildlife Service concluded that the proposed action and alternatives would be likely to jeopardize the continued existence of any endangered or threatened plant or animal species, then the APD and lease development may be denied by the FS or BLM in whole or in part.

2.2.5 Alternatives Considered But Not Analyzed in Detail

In addition to Alternatives A and B, and the No Action Alternative, other alternatives were considered but not fully evaluated due to: (1) their inability to meet environmental constraints, (2) land and resources management objectives, and (3) the proponents needs for an optimal initial test. Descriptions of these alternatives are presented in the following sections.

2.2.5.1 Drill the Well from a Site Located in the NE1/4 NW1/4 of Sec 9 T9S R20E

The drill site in Section 9 was Phillips' original proposal for a preferred drill site location on the Line Creek Plateau. The site afforded Phillips an optimal location for drilling a vertical test hole. The site is located toward the north end of the Line Creek Plateau approximately seven miles south of Red Lodge, Montana, at an elevation of 9,367 feet (Exhibit 2-9).

As previously mentioned in Chapter 1, Phillips rescinded the APD for this drill site proposal and replaced it with Alternative A for the following reasons:

- o public controversy;
- o the wide range of environmental issues identified during scoping;
- o the environmental sensitivity of the Line Creek Plateau; and
- o a modification in the interpretation of the seismic data that shifted the geologic structure to the southeast, thus making a directional well technically feasible and a more acceptable risk.

No additional analysis of the Line Creek drill site was completed following withdrawal of

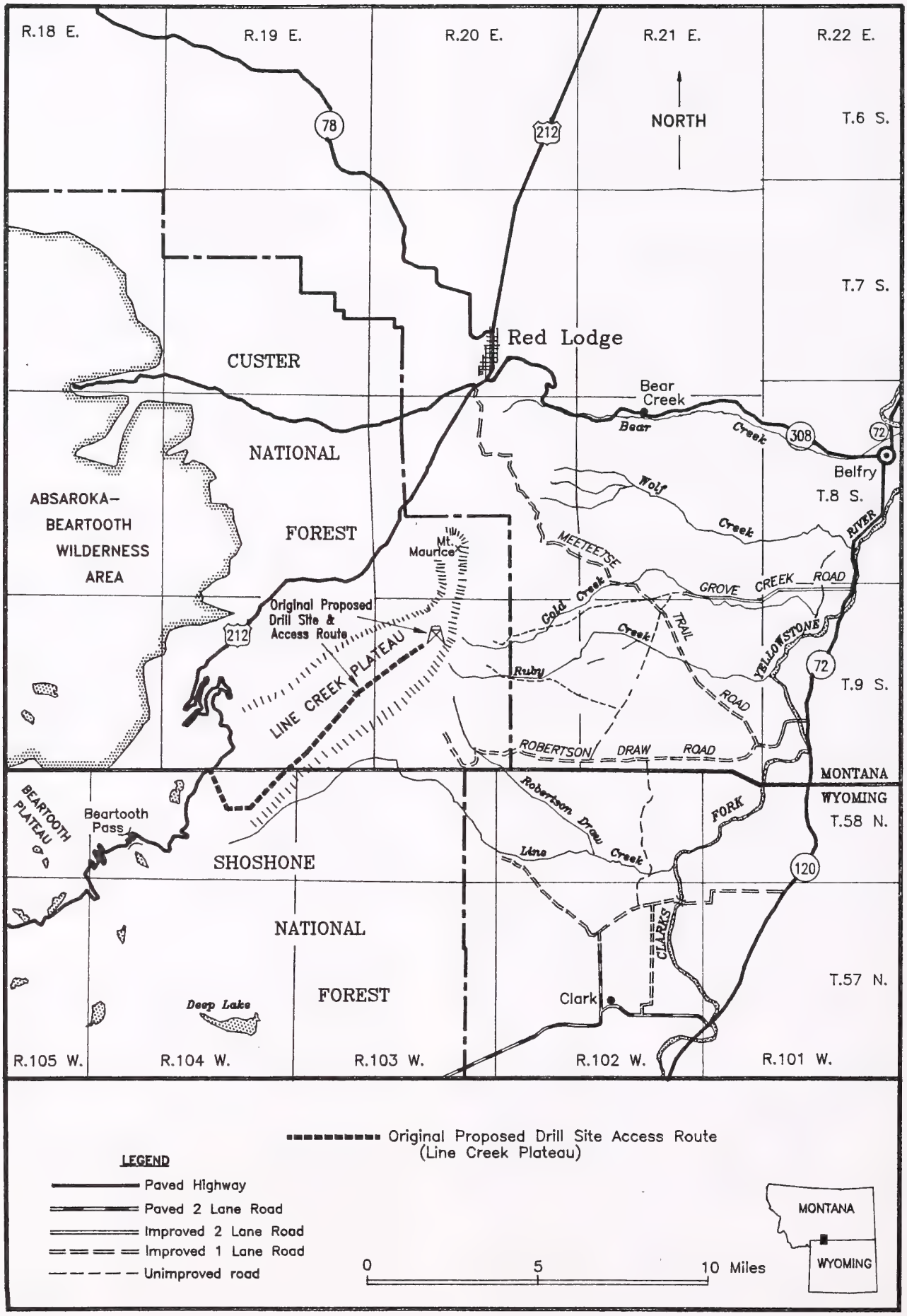

Exhibit 2-9. Alternatives Considered But Not Analyzed in Detail.

the APD. Because the Line Creek drill site proposal has been withdrawn by Phillips, this alternative was eliminated from further consideration in the analysis process.

2.2.5.2 Directionally Drill the Well from a Site Located on Private Land to the East of the Proposed Drill Site

This alternative would involve directionally drilling the well from a private land location east of the proposed Ruby Creek site. As previously discussed, Phillips proposes to drill a deviated (i.e., directional) exploratory well using specialized directional drilling equipment and techniques. In order to adequately evaluate the potential geologic structures, drilling needs to enter the zones of interest vertically. The ability to drill directionally and enter the zones vertically is extremely important in obtaining reliable information regarding the subsurface structures. Because of the structures being drilled and drill site vertical and horizontal displacement limitations described in *Appendix G and* Section 2.2.3 of the EIS, the exploratory well site would be located on the Custer National Forest. Moving off-Forest would severely limit the exploration opportunities of these leases and create an unacceptably high risk that virtually precludes Phillips' ability to evaluate the zones of interest during an exploratory test. This alternative was eliminated from further consideration because it did not meet the proponents needs for an optimal initial test well location.

2.2.5.3 Drill the Well from a Site Located in the NE1/4 NE1/4 of Section 9 T9S R20E on the North End of the Line Creek Plateau Using Helicopter Mobilization and Support

This alternative was considered in conjunction with the original drilling proposal on the north end of the Line Creek Plateau. This alternative called for accessing the drill site using helicopter mobilization and support methods rather than roaded or over-the-ground access. It was not fully evaluated because of the high cost and technical difficulties of *using a helicopter to mobilize a drill rig at the plateau.* The high elevations (nearly 10,000 feet) combined with strong winds and a short favorable operating season made this alternative unfeasible in regard to safe operation.

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AFFECTED ENVIRONMENT

Chapter 3

AFFECTED ENVIRONMENT

Chapter 3

CHAPTER 3

3.0 AFFECTED ENVIRONMENT

The Affected Environment chapter of this Environmental Impact Statement (EIS) for the proposed Ruby A Federal No. 1-9 exploratory oil/gas well (Ruby A Federal) discusses environmental, social, and economic factors as they currently exist within the analysis area. The material described here has been guided by public issues identified through the scoping process and interdisciplinary field analysis.

The following resources are not present in the analysis area or would not be affected by the proposal, and therefore they will not be addressed in this chapter or in Chapter 4 (Environmental Consequences):

- Wild and Scenic Rivers
- Areas of Critical Environmental Concern (ACECs)

Technical reports containing more detailed information than what is presented in this chapter and Chapter 4 were prepared by the consultant interdisciplinary team (IDT) to provide the basis for the analysis of impacts to various resources in this EIS. They are available for review at the Forest Service (FS) Custer National Forest Supervisor's Office in Billings, Montana, and the Beartooth Ranger District Office in Red Lodge, Montana; and at the Bureau of Land Management (BLM) Billings Resource Area Office in Billings, Montana and the Miles City District Office in Miles City, Montana.

3.1 AIR QUALITY

3.1.1 Introduction

Air quality in the project area, although not monitored, is good to excellent with low ambient concentrations of pollutants due to minimal industrial development in the area. Minor, short-term occurrences of airborne pollutants could occur periodically in the area due to natural fires and fires from logging slash or controlled burns. Pollution from the few industries in the area is not expected to affect the air quality of the project area. The prevailing wind direction in the area is likely northwest in the winter and southwest in the summer. The rough and mountainous terrain, in combination with diurnal changes in temperature, greatly alters the surface air flow over the affected area and provides for continuous air movement and circulation. Generally, local upslope winds occur from late morning through late afternoon, and local downslope winds occur from evening through the mornings. These factors provide good dispersion rates. No areas of poor dispersion are expected in the affected area.

The affected area has been designated as Class II, which includes areas that may be industrialized with release of certain pollutants within the requirements of the State of Montana Air Quality Bureau's ambient and prevention of significant deterioration (PSD) standards. Class I areas, including wilderness areas established prior to the enactment of the Clean Air Act in 1977 and national parks, have more stringent standards than the Class II areas. The nearest Class I area to the proposed drill site is Yellowstone National Park, located approximately 33 miles to the west of the project area.

3.2 TRANSPORTATION

3.2.1 Introduction

As shown on Exhibits 1-1 and 1-2, the major transportation system in the area consists of Interstate 90, located approximately 50 miles to the north; U.S. Highways 212 and 310; Montana Highway 72; and Wyoming Highway 120. Of these highways, only Montana Highway 72 and Wyoming Highway 120 are within the project's affected environment since traffic associated with this project would predominantly utilize these highways. Data from the Montana Highway Department for 1987 estimated an annual average daily traffic use level of 740 vehicles per day (vpd) for Montana Highway 72 (Colbert 1989). Average daily traffic (ADT) peaks at 1,090 vpd in July and declines to a low of 520 vpd in January. This traffic is primarily a mixture of tourist, trucking, and resident use. The Montana Highway Department classifies Highway 72 as Service Level B. The following conditions define this service level: traffic occurs as stable flow in the upper velocity range, velocities begin to be restricted, and the highway offers safe passing sight distance

(Kovich 1989). The current condition of the highway includes areas with cracked asphalt pavement and differential settling of the road bed. The Montana Highway Department plans to widen portions of the highway and resurface all of the highway from the Wyoming state line to Belfry, Montana during the 1989 construction season.

Numerous county roads in the project area originate from Montana Highway 72 and Wyoming Highway 120. Carbon and Park counties maintain these roads, which are two-lane paved or gravel surfaced roads and graded dirt roads. Major county roads providing public travel in the project vicinity include the road leading to Clark, Wyoming, Robertson Draw Road, Meeteetse Trail road, and Grove Creek Road as shown on Exhibits 1-2, 2-2, 3-1, and 3-2. In addition, there are numerous roads in the project area that are not maintained. Exhibit 3-1 shows the current status and condition of roads of interest in the project area. The following sections discuss the roads in greater detail.

3.2.2 Alternative A - Proposed Action

3.2.2.1 Phillips' Proposed Access Route (A1)

Phillips' proposed access route (A1) would originate from Montana Highway 72 approximately 4.3 miles south of Belfry, Montana, as shown on Exhibit 3-2. From this point, the access route heads west for 5.0 miles on the county-maintained public Grove Creek Road to its terminus near the Anderson Ranch. This section of existing improved road is a two-lane graveled road crossing privately owned land except for approximately 0.6 miles of BLM-administered land. This segment of the access route would require no improvement. From this point the access route utilizes 1.1 miles of existing unimproved road to the county-maintained public Meeteetse Trail road; *however, public access to the Meeteetse Trail over this route is not allowed by the land owner.* The route crosses the Meeteetse Trail and continues south southwest along an existing unimproved two-track road for approximately 3.3 miles to the unimproved two-track road paralleling Mill Draw. From this point the access route heads west northwest for approximately 3.6 miles along the unimproved two-track road that parallels Ruby Creek to the Forest boundary. The access route continues west from the Forest boundary for approximately 0.8 miles along an administratively closed unimproved two-track road to its terminus.

This segment of the road crosses Ruby Creek by a low water crossing (i.e., no culvert or bridge). From the end of the existing road, approximately 0.3 miles of new road would be constructed to access the drill site.

The unimproved two-track roads used to access the drill site are one-lane, ungraded roads without drainage control. The alignment of these roads primarily resulted from random vehicular traffic across the relatively flat areas leading to the mountain front. Consequently, use of these roads would require major reconstruction, including minor realignment, grading, shaping, and placement of efficient drainage control structures such as ditches and culverts.

From the end of county maintained Grove Creek Road, the access route traverses approximately 5.6 miles of private land, 2.4 miles of BLM-administered land, and 1.1 miles of FS-administered land. Table 3-1 summarizes by road class and land ownership the cumulative mileage that this access route traverses. The portion of the route that utilizes unimproved two-track road and that crosses private land does not include public access right-of-way, but the private land owners have not precluded public access to the Forest boundary.

3.2.2.2 Meeteetse Trail - Robertson Draw Access Route (Variation A2)

The initial portion of the Meeteetse Trail - Robertson Draw access route is the same as described above for Variation A1 from Montana Highway 72 to 1.1 miles beyond the end of Grove Creek Road. From this point, the access route follows the county maintained public Meeteetse Trail road for 4.4 miles to its intersection with Robertson Draw Road as shown on Exhibit 3-2. Although the Meeteetse Trail is said to be maintained, it has few, if any, drainage control structures and consists of a graded dirt surface. Consequently, the road is rutted and has a washboard surface along several sections. The road width varies from one to two-lanes; however, it is typically one and one-half lanes wide. The road crosses several ephemeral and intermittent drainages including Dilworth Creek and Mill Draw. From the intersection of the Meeteetse Trail

Table 3-1. Cumulative Access Route Mileage by Road Class and Land Ownership for Alternatives A and B.

Road Class/ Land Ownership		Alternative A					Alternative B
		A1[a]	A2	A3	A4	Drill Site Variation	
County Improved Road							
	Private	4.4	13.2	5.8	6.9	4.4	4.4
	BLM	0.6	2.6	1.3	0.7	0.6	0.6
	FS	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal		5.0	15.8	7.1	7.6	5.0	5.0
Unimproved Road							
	Private	5.6	4.7	4.3	7.3	5.6	3.4
	BLM	2.4	1.3	0.7	2.0	2.4	1.9
	FS	0.8	0.8	0.8	0.8	0.4	0.0
Subtotal		8.8	6.8	5.8	10.1	8.4	5.3
New Road							
	Private	0.0	0.0	0.0	0.0	0.0	0.4
	BLM	0.0	0.0	0.0	0.0	0.0	0.0
	FS	0.3	0.3	0.3	0.3	0.0	0.5
Subtotal		0.3	0.3	0.3	0.3	0.0	0.9
TOTAL		**14.1**	**22.9**	**13.2**	**18.0**	**13.4**	**11.2**
Bridge over Clarks Fork	-	-	X	-	-	-	-

a - Phillips' proposed access route

and Robertson Draw roads, the access route follows Robertson Draw Road for approximately 5.8 miles to an intersection with an unimproved two-track road in the SW1/4 of Sec 30 T9S R21E that heads north. The county and the FS jointly maintain Robertson Draw Road, which provides public access to the Forest and to a FS administrative site. This road is similar in character to the Meeteetse Trail except that Robertson Draw Road appears to receive more frequent maintenance. From this intersection, the access route heads north along an unimproved two-track road to Mill Draw where the route intersects the access route described above for Variation A1. The character of this unimproved two-track road and the additional road to the Forest boundary is similar to the description provided under A1.

The Meeteetse Trail and Robertson Draw Road are both public roads, each with legal right-of-way across private land. The portion of the access route that utilizes Grove Creek Road, Meeteetse Trail, and Robertson Draw Road includes 2.6 miles of BLM-administered land and 13.2 miles of private land. From the point where the access route deviates from Robertson Draw Road, the route crosses 4.3 miles of privately owned land and 0.7 miles of BLM-administered land to the Forest boundary. Table 3-1 summarizes by road class and land ownership the cumulative mileage that this access route traverses. The last segment of this route that crosses private land does not include public access right-of-ways. Private land owners, however, have not precluded public access to the Forest boundary.

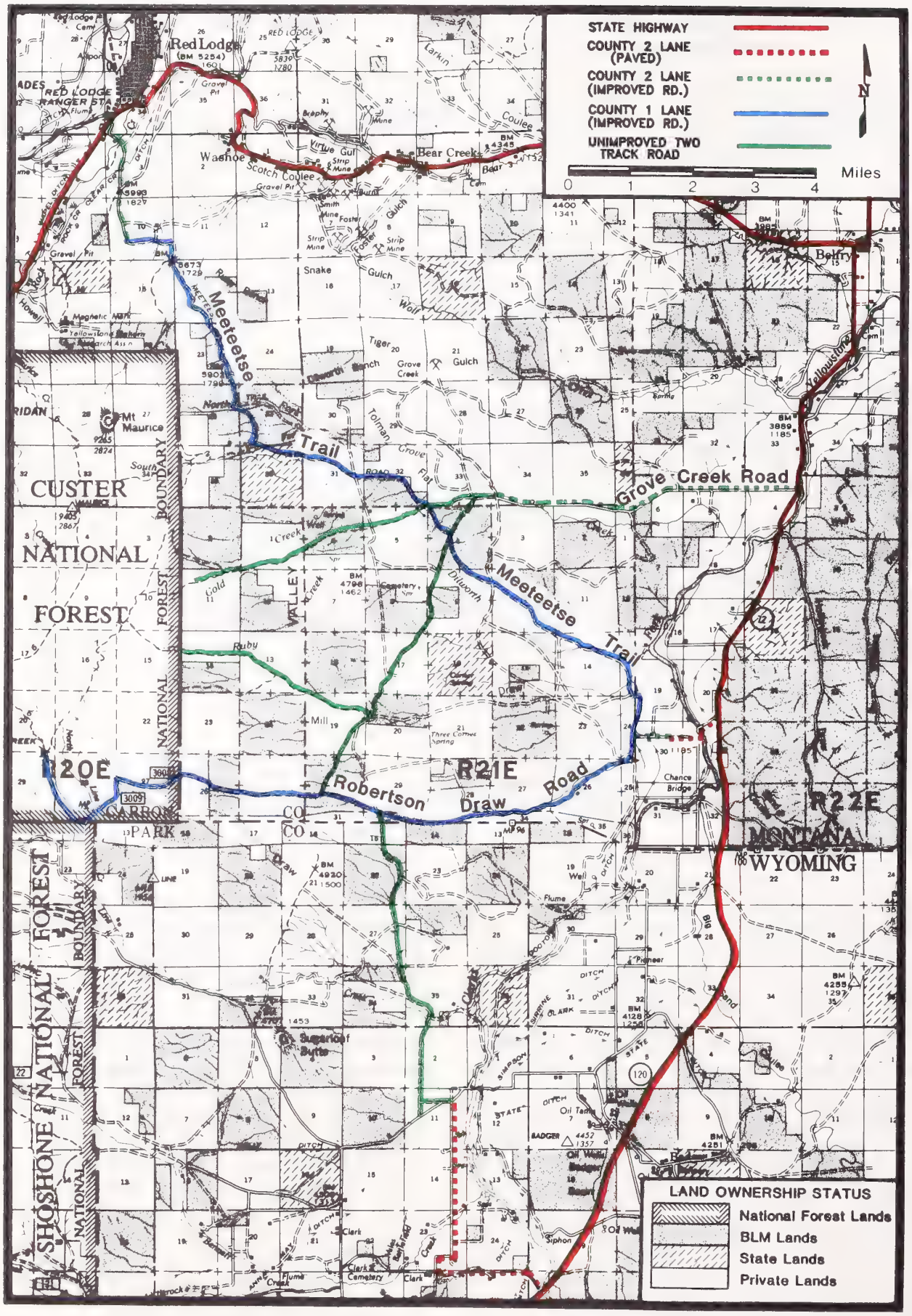

Exhibit 3-1. Location and Status of Existing Roads in the Project Area.

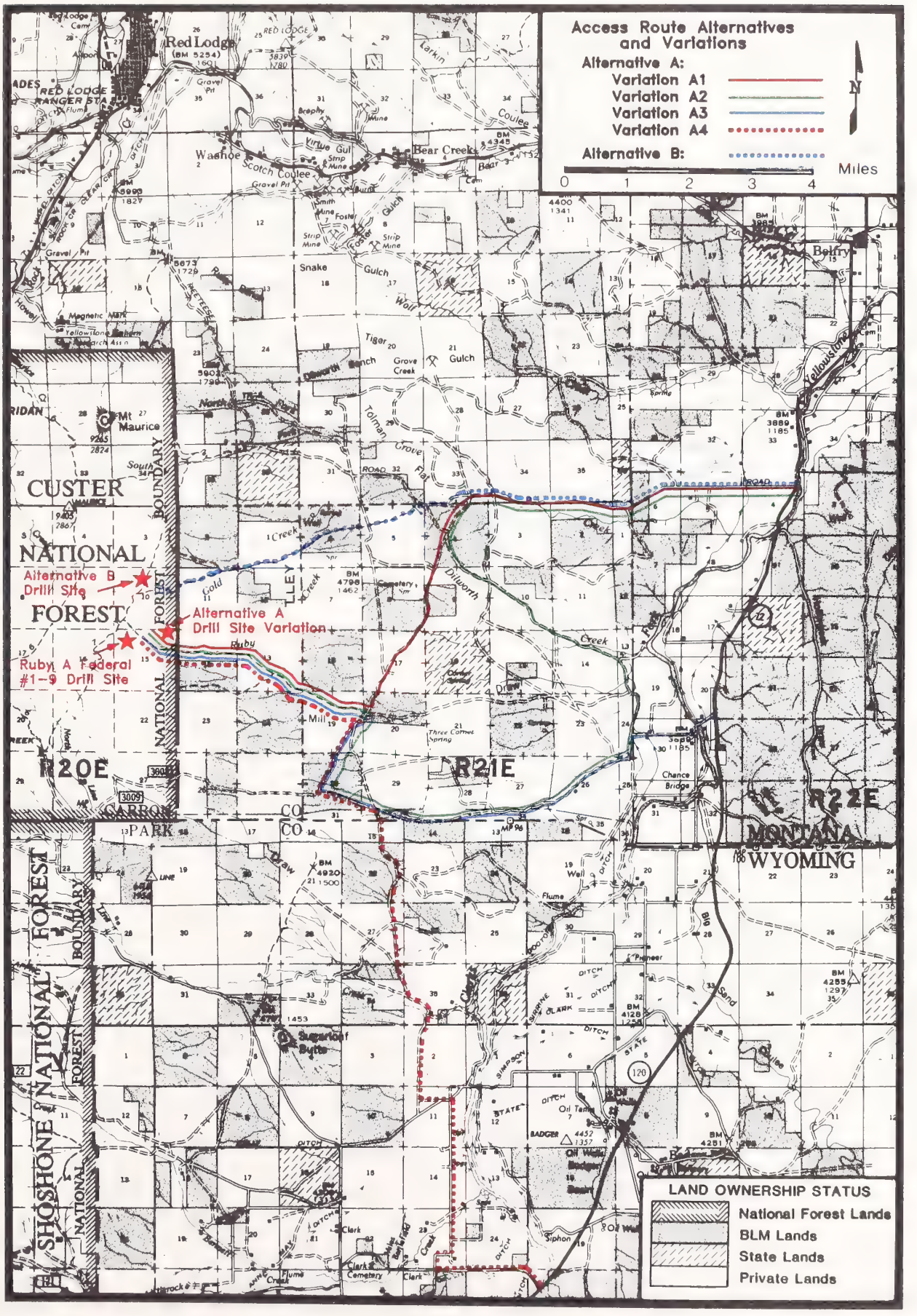

Exhibit 3-2. Location of Alternative A Access Route and Routing Variations and Alternative B Access Route.

3.2.2.3 Southern Access - Robertson Draw Access Route (Variation A3)

The Southern Access - Robertson Draw access variation originates from Highway 72 approximately 2.2 miles north of the Wyoming border and approximately 8.2 miles south of Belfry, Montana, as shown on Exhibit 3-2. From this point, the access route follows a county road west for 1.5 miles to an intersection with the Meeteetse Trail and Robertson Draw Road previously described under Variation A2. The access route crosses the Clarks Fork of the Yellowstone River (Clarks Fork) by a steel truss bridge with a 8 ton load limit. This segment of the access route is similar to Grove Creek Road as described previously (Variation A1). From this intersection the access route is identical to Variation A2. From the Montana State Highway 72 to the proposed drill site, this route traverses 10.1 miles of private land, 2.0 miles of BLM-administered land, and 1.1 miles of FS-administered land. Table 3-1 summarizes by road class and land ownership the cumulative mileage for this access route.

The portion of this route from Highway 72 to the point where the route diverges from Robertson Draw Road is used to access the Doctor Ditch Oil/Gas Field located just over the Wyoming border (Exhibit 2-1). Recent observation indicates that the facilities at this field have been shut-in for at least five years; therefore, the road has not been used recently for access to the field.

3.2.2.4 Clark Wyoming Access Route (Variation A4)

The Clark Wyoming access variation would originate from Wyoming Highway 120 approximately 8.6 miles south of the Montana border as shown on Exhibit 3-2. From this point the access route follows an improved Park County road for approximately 2.0 miles towards Clark, Wyoming, to an intersection with Park County road 8WC. The route would then turn north along road 8WC and proceed 2.4 miles to the intersection with Park County road 8VC. The access route follows road 8VC west for approximately 0.5 miles to an intersection with a graded dirt road heading north to the Joanne Ranch. The access route heads north on this dirt road for 1.8 miles to a locked entrance gate to the Joanne Ranch. From this point the access route crosses Joanne Ranch property and heads north approximately 4.3 miles along unimproved two-track roads to the point along Robertson Draw Road where access route Variation A2 and A3 diverge from Robertson Draw Road in the SW1/4 of Sec 29 T9S R21E. This route traverses several steep slopes approximately 1.5 miles south of the Montana border. These slopes would require road sections in excess of 15 percent. The rest of the unimproved two-track road is similar to the previous descriptions.

From the county improved roads to the proposed drill site, this route traverses 7.3 miles of private land, 2.0 miles of BLM-administered land, and 1.1 miles of Forest land. Table 3-1 summarizes by road class and land ownership the cumulative mileage for this access route. Public use of the road from the south (i.e., Clark, Wyoming) is not allowed as evidenced by a locked gate and "no trespassing" signs.

3.2.2.5 Alternative A Drill Site Variation

The access route to the Alternative A Drill Site Variation would be the same as described for the Proposed Alternative A - Ruby Creek Drill Site. Access to the drill site variation would require 0.3 miles less new road construction and 0.4 miles less of unimproved road reconstruction on Forest land than that necessary to access the Proposed Alternative A drill site location.

3.2.3 Alternative B - Gold Creek Site

From Montana Highway 72 to the end of Grove Creek Road, the initial portion of the Alternative B access route is the same as described previously for Variation A1. From this point the access route utilizes 1.2 miles of existing unimproved road to an intersection with Meeteetse Trail road as described previously. *Public access to the Meeteetse Trail over this route is not allowed by the land owner.* From this point, the access route continues west along an existing unmaintained road for 4.1 miles to the abandoned Amoco drill site in the NW1/4 of Sec 11 T92 R102W as shown on Exhibit 3-2. This one-lane road was reconstructed by Amoco to access the wildcat drill site constructed in 1976 (USDI-BLM 1986). The road has not been maintained since that project's completion and therefore is not surfaced. The road crosses Gold Creek by

culvert as the road enters the Gold Creek canyon. From the Amoco drill site, the access route continues west, paralleling Gold Creek along an unimproved trail, for approximately 0.4 miles, to the Forest boundary. From the Forest boundary, the route continues west paralleling Gold Creek for approximately 0.2 miles. At this point the route turns north and switchbacks up a hillslope to the alternative drill site for an additional 0.3 miles. From the end of Grove Creek Road, this access route traverses approximately 3.8 miles of private land, 1.9 miles of BLM-administered land, and 0.5 miles of Forest land. Table 3-1 summarizes by road class and land ownership the cumulative mileage that this access route traverses. The portion of the route that crosses private land does not include public access right-of-ways, and the private land owners have not authorized public access to the Forest boundary.

3.3 GEOLOGY/SOILS

3.3.1 Introduction

3.3.1.1 Geology

The project area lies on the margin or transition between the Beartooth Mountains of the Middle Rocky Mountains Physiographic Province and the Big Horn Basin extension of the Great Plains Physiographic Province (Thomas 1965 and Foose, Wise and Garbarini 1961). More specifically, the project area lies on the alluvial plains, fans, terraces, and bedrock toe slopes of the eastern margin of the Line Creek Plateau, which is the northeast extension of the Beartooth Plateau of the Beartooth Mountains. The eastern escarpment of the Line Creek Plateau rises abruptly from the alluvial plains of the Clarks Fork of the Yellowstone River at an elevation of approximately 4,000 feet, to 9,400 feet on the surface of the plateau due west of the project area. The 5,400-foot vertical rise in elevation occurs in a horizontal distance of nine miles, with most of the rise (3,000 feet) occurring within two miles.

The Beartooth Mountains, Beartooth Plateau, and Line Creek Plateau can best be described as a block of the earth's crust consisting of Precambrian crystalline metamorphic and igneous rock uplifted approximately 20,000 feet to today's elevation (Foose, Wise and Garbarini 1961). The overlying sedimentary rocks have eroded away to expose the crystalline rocks of the block. In the immediate vicinity of the project area, this block has been thrust up and over the younger Paleozoic and Mesozoic sedimentary rocks along a series of deep-seated faults as well as along surface faults such as the Beartooth Fault, which parallels the eastern escarpment of the Line Creek Plateau. This tectonic movement caused the surrounding sedimentary rocks to buckle and tilt up at high gradients to form the unusual geologic formations known as the Meeteetse Spires and other similar palisades along the northeastern margin of the Beartooth and Line Creek plateaus. More recently in geologic time, the eastern escarpment of the Line Creek Plateau has been scoured and plucked by alpine glaciation forming subtle, shallow bowls and cirques in the headwaters of major streams such as Ruby Creek and Gold Creek. The glaciers deposited morainal material (ground and lateral moraines) on the toeslopes of the Line Creek Plateau while streams originating from glacial meltwaters deposited large outwash terraces, fans, and plains.

Potential natural geologic hazards in the project area include avalanches, rock falls, landslides, slumps, debris flows, and ground motion caused by earthquakes. Except for ground motion, these gravity-related hazards are transient in time, are highly localized, and have minimal areal extent and, therefore, do not pose significant danger or hazard to warrant special concern. The project area lies within the southwestern corner of the Montana Seismic Belt (Qamar and Stickney 1983). In recent geologic time, this area has been relatively quiet in regard to movement along faults and subsequent earthquakes. The project area lies in a Zone 2 seismic risk area (Coffman and Von Hake 1973). This risk zone indicates that moderate damage could result from seismic ground motion. There are no known active faults in the immediate vicinity of the project area (Witkind 1975).

The proposed Ruby A Federal well is designed to test a large subthrust anticline along the east edge of the Line Creek Plateau in the northern Big Horn Basin. This well is projected to reach a total depth of 12,520 feet (true vertical depth approximately 11,600 feet) in the Ordovician Bighorn Dolomite. Primary objectives are the Cretaceous Frontier Sandstone, Permian Phosphoria Formation and Pennsylvanian Tensleep Sandstone. Other

objectives include the Cretaceous Dakota Sandstone, Mississippian Madison Limestone and Ordovician Bighorn Dolomite. These formations have combined to produce over 500 million barrels of oil at Elk Basin Field, which is a large surface anticline located about 17 miles to the southeast of the project area. The targeted structure is a north-south trending compressional feature formed during the Laramide Orogeny from late Cretaceous to early Tertiary time. The structure was identified in the subsurface using seismic data that was integrated with limited well control.

The proposed well would be directionally drilled to a bottom-hole location approximately 3,700 feet northwest of the proposed drill site. The rig would commence drilling in vertical Paleozoic rocks at or near the surface and eventually penetrate roughly 2,000 feet of granite before re-entering sediments below a major thrust fault at 4,100 feet (true vertical depth). This fault has over 15,000 feet of vertical displacement and at least twice that much lateral offset. About 2,000 feet of overturned Mesozoic sediments are believed to exist below the granite. A normal, upright Cretaceous section is anticipated below the last major thrust fault at a depth of 6,100 feet. Subthrust Frontier and Phosphoria Formations are projected at true vertical depths of 6,900 and 9,800 feet, respectively. Exhibit 2-6 presents the structural cross-section of the proposed directional drilling attempt.

3.3.1.2 Soils

Soils in the project area have formed on the eastern slopes, footslopes and alluvial plains of the Line Creek Plateau and on the floodplains of the Clarks Fork of the Yellowstone River. The soils within the project area are variable due to the large contrasts in topography, microclimate, vegetation, parent material, and geomorphic processes involved. Parent materials include igneous, metamorphic, and sedimentary bedrock; colluvium on the steeper slopes; and alluvium (including material deposited in glacial outwash plains). Most soils are in the Aridisol and Entisol orders of soil classification; some soils at the upper elevations of the alluvial plains and terraces are in the Mollisol order.

The following description of soil resources in the project area is based on field sampling and observation; analysis of samples collected in the project area; the soil survey of Carbon County, Montana area prepared by the USDA Soil Conservation Service (USDA-SCS 1971); and soils information presented by USDA-FS (1977). The Carbon County Soil Survey (USDA-SCS 1971) covers only the eastern portion of the project area to the Custer National Forest boundary (Forest boundary). The published soil survey contains the detailed maps showing the distribution and location of the various soil mapping units. A comprehensive and detailed soil survey has not been completed for the portion of the project area on FS-administered land. However, soil sampling and description were accomplished specifically at the drill site and access roads on Forest land as presented in the respective sections. Important soil characteristics relative to determining impacts due to this project include erosion hazard or potential and revegetation potential. Table 3-2 summarizes the characteristics of the major soils that occur in the project area.

3.3.2 Alternative A - Proposed Action

3.3.2.1 Access Route

From Montana State Highway 72, just west of the Clarks Fork of the Yellowstone River, access follows the improved county Grove Creek Road for approximately five miles (Exhibit 3-2). The first one and one-half miles of this road traverse land under irrigated cultivation at an elevation of approximately 4,000 feet. The soils in this section of road are predominantly level or nearly level, deep, well-drained clays of the Kyle series derived from weathered calcareous clay shales; silty clay loams of the Heldt series derived from deep alluvium; and clay loams of the Tonra series derived from alluvium. The Heldt series is classified as prime farmland (Klessens 1988). Prime farmlands include soils that provide the best combination of physical and chemical conditions for growing food, feed, forage, fiber, or oil seed crops. These soils include only those that are currently under production or are available for conversion to farmland.

The next three and one-half miles of the proposed access route traverse the bottomland of Grove Creek and rolling open upland covered with grasslands and sagebrush scrub near Grove Creek at elevations of 4,000 feet to 4,300 feet. The soils in this section of access route include Heldt, Kyle, Bowbac,

Travessilla, Torchlight, and Midway series. These soils are deep clays, clay loams, and silty clay loams derived from deep alluvium and shale. These soils are well-drained, have very slow to slow permeabilities, slight to moderate erosion hazard, a high shrink/swell potential, and have a low stability hazard. Soil pH ranges from 6.6 to over 9.0. Road improvement and reconstruction are not planned on this five-mile length of existing road.

From the end of the improved county Grove Creek Road to the Forest boundary, the access route follows approximately eight miles of existing unimproved two-track roads. These roads will be improved with levels of effort ranging from minor bladework to major reconstruction. This portion of the route traverses relatively flat to hilly, gently sloping to steeply sloping glacial and alluvial outwash plains, terraces, fans, and rolling erosional surfaces at elevations from 4,300 feet to 6,200 feet. Soils of the first two miles of the access route include Romberg very stony loams, Midway-Travessilla association, Toluca clay loam, Vona fine sandy loam, and Torchlight clay soils. The Midway-Travessilla soils developed from shale beds, Toluca clays from deep calcareous loamy material, Vona fine sandy loam from alluvium, and Torchlight clay from highly alkaline and saline gypsiferous residuum. Runoff rates range from slow for the Vona soil to rapid for the Torchlight soil; erosion hazards range from slight for the Toluca soil to moderate for the other three soils; pH ranges from 6.6 for the Toluca soil to over 9.0 for the Torchlight soil; depth to high water table is greater than 60 inches for each of the four soils; permeabilities range from slow for the Midway and Torchlight series to rapid for the Vona series; and shrink/swell potential is low and moderate for the Vona, Toluca, and Midway-Travessilla soils and is high for the Torchlight clay soil. These soils are only poor to fair for road subgrade due to their high shrink/swell and frost action potentials, and topsoil suitability is mostly poor due to high coarse fragment or clay content. These soils have a low stability hazard.

The majority of soils that the access route crosses from the end of Grove Creek Road to the Forest boundary are classified as Romberg very stony loam, Romberg extremely stony loam, Romberg-Shale outcrop, and Stormitt complex. These soils are deep, well-drained very stony loams and gravelly clay loams that formed on terraces in deep glacial outwash typical of most of this section of road. There is a significant fraction of fragments larger than 3 inches in diameter contained in these soils, especially in the Romberg extremely stony loam which has large glacial erratic stones and boulders of granitic origin. Runoff rate is medium to rapid, erosion hazard is slight to moderate, permeability is moderate to moderately rapid, shrink/swell potential is low, depth to high water table is greater than 60 inches, and soil pH ranges from 6.6 to 9.0. Topsoil and road subgrade suitability of these soils are poor due to high coarse fragment content. These soils have a low stability hazard.

In the last mile before the Forest boundary, the access road crosses Maurice stony loam and Windham cobbly clay loam as it leaves the alluvial plains and climbs the small valley of Ruby Creek. Both soils are deep, well-drained, loamy, skeletal soils. Maurice stony loam developed from deep gravelly and cobbly alluvial material on fans and uplands, while the Windham cobbly clay loam developed from gravelly and loamy material weathered from limestone on footslopes and uplands. Runoff rate is medium, permeability ranges from moderate to very rapid, erosion rate is slight to moderate, pH is 7.4 to 8.4, and shrink/swell potential is low for these soils. These soils are fair to good for road subgrade but poor for topsoil due to high coarse fragment content. These soils have a low stability hazard.

Major road reconstruction would occur along the route of an existing unimproved two-track road for approximately 0.8 miles beyond the Forest boundary. This route climbs the valley of Ruby Creek and one of its northern tributaries from an elevation of 6,200 feet to an elevation of 6,800 feet. Based on extrapolation from the soils mapped adjacent to the Forest boundary, the route traverses Windham cobbly clay loam modified to varying degrees by an increase in granitic colluvium and ground moraine.

The soil takes on more characteristics of a granitic-derived soil and fewer characteristics of a limestone-derived soil the closer it is to the drill site area. As a part of this trend the soil characteristics tend more toward that of a sandy loam, and the quantity of granitic gravels, cobbles, and boulders tends to increase near the drill site.

Table 3-2. Characteristics of Major Soils along New and Reconstructed Access Routes and at Drill Sites (Revised from USDA-SCS 1971 and USDA-FS 1977).

Characteristic	SOIL MAPPING UNIT					
	Midway Travessilla-Hilly	Toluca Clay Loam	Torchlight Clay	Vona Fine Sandy Loam	Romberg Very Stony	Romberg Shale Outcrop
Landform	Upland Plains	Alluvial Terraces	Alluvial Fans	Alluvial Terraces	Rolling Terraces	Steep Terrace
Parent Material	Shale Bed	Calcareous loam	Alkaline Saline Residuum	Alluvium	Glacial Outwash	Glacial Outwash
Elevation	4,500 ft	4,500 ft	4,600 ft	4,800 ft	4,500 - 4,800 ft	4,600 ft
Slope	15-45 percent	4-8 percent	5-20 percent	2-4 percent	5-15 percent	20-40 percent
Vegetation	Sagebrush scrub	Sagebrush scrub	Sagebrush scrub	Sagebrush scrub	Sagebrush scrub	Sagebrush scrub
Taxonomy	Clayey, montmorillonitic Ustic Torriorthents	Fine loamy, mixed Ustollic Haplargids	Fine, montmorillonitic Vertic Torriorthents	Coarse loamy, mixed Ustollic Haplargids	Loamy skeletal, mixed Ustollic Haplargids	Loamy skeletal, mixed, Ustollic Haplargids
Depth	Shallow	Deep	Deep	Deep	Deep	Deep
Texture	Silty clay loam Silty clay	Clay loam	Clay	Fine sandy loam	Very stony loam Gravelly clay loam	Very stony loam Gravelly clay loam
Permeability	Slow	Moderate	Slow	Moderately rapid	Moderate	Moderate
pH	7.4-8.4	6.6-9.0	8.5->9.0	7.9-8.4	7.9-8.4	7.9-8.4
Water Capacity	0.14-0.18 in/in	0.15-0.18 in/in	0.10-0.14 in/in	0.04-0.08 in/in	0.04-0.08 in/in	0.04-0.08 in/in
Shrink/Swell Potential	Moderate	Moderate	High	Low	Low	Low
Depth: High Water Table	>60"	>60"	>60"	24"-60"	>60"	>60"
Depth: Bedrock	<20"	>60"	>60"	>60"	>60"	>60"
Drainage Class	Well	Well	Well	Well	Well	Well
Runoff Rate	Rapid	Medium	Rapid	Slow	Medium	Rapid
Erosion Hazard	Moderate	Slight	Moderate	Moderate	Slight	Moderate
Source of:						
Topsoil	Poor: steep slopes, clay	Poor: clay	Poor: alkaline, clay	Good content	Poor: high coarse fragment content	Poor: high coarse
Gravel	Unsuitable: fines	Unsuitable: fines	Unsuitable: fines	Unsuitable: fines	Poor: fines, large fragments	Poor: fines,
Road Subgrade	Poor: frost action	Poor: frost action	Poor: shrink/swell	Fair: frost action	Poor: large fragments fragments	Poor: large
Revegetation Potential	Fair	Fair	Poor	Fair to good	Poor	Poor

Table 3-2. Continued.

Characteristic	SOIL MAPPING UNIT					
	Romberg Extremely Stony	Maurice Stony Loam	Windham Cobbly Clay Loam	Rentsac Rock Outcrop	Stecum	Como
Landform	Sloping Terraces	Alluvial Fans	Foot terraces slopes and fan	Steep uplands	Mountain Slopes	Gently rolling moraine
Parent Material	Glacial outwash	Glacial outwash, alluvium	Residuum from limestone	Calcareous sandstone	Residuum from granitic bedrock and moraine	Glacial moraine
Elevation	4,600-5,500 ft.	5,500 ft	5,500-6,500 ft	6,500-7,000 ft	7,000 ft	6,400-7,000 ft
Slope	15-30 percent	20-40 percent	10-20 percent	20-60 percent	30-80 percent	10-30 percent
Vegetation	Sagebrush scrub	Sagebrush scrub Limber pine woodland	Sagebrush scrub Limber pine woodland	Sagebrush scrub Limber pine woodland	Limber pine woodland Mixed conifer	Limber pine woodland Mixed conifer
Taxonomy	Loamy skeletal, mixed Ustollic Haplargids	Loamy skeletal, mixed Typic Cryoborolls	Loamy skeletal, carbonatic, Typic Calciborolls	Loamy skeletal, mixed Lithic Ustic Torriorthents	Sandy skeletal Typic Cryorthents	Sandy skeletal Typic Cryochrepts
Depth	Deep	Deep	Deep	Shallow	Shallow to Deep	Deep
Texture	Very stony loam Gravelly clay loam	Stony loam	Cobbly clay loam	Channery loam	Coarse sandy loam	Very bouldery loam Very bouldery sandy loam
Permeability	Moderate	Rapid	Moderately slow	Moderately rapid	Rapid	Rapid
pH	7.9-8.4	7.4-8.4	7.4-8.4	7.9-8.4	7.9-8.4	7.9-8.4
Water Capacity	0.04-0.08 in/in	0.04-0.08 in/in	0.04-0.08 in/in	0.04-0.08 in/in	0.04-0.08 in/in	0.04-0.08 in/in
Shrink/Swell Potential	Low	Low	Low	Low	Low	Low
Depth: High Water Table	>60"	24"-60"	>60"	>60"	>60"	>60"
Depth: Bedrock	>60"	>60"	>60"	<20"	>32"	>98"
Drainage Class	Well	Well	Well	Well	Well	Excessive
Runoff Rate	Medium	Medium	Medium	Very Rapid	Moderate	Slow to moderate
Erosion Hazard	Slight	Moderate	Slight	Severe	Moderate	Low
Source of:						
Topsoil	Poor: high coarse fragment content	Poor: high coarse fragment content	Poor: high coarse fragment content	Poor: high coarse fragment content	Poor: high coarse fragment content	Poor: high coarse fragment content
Gravel	Poor: large fragments	Unsuitable: fines	Unsuitable: fines	Unsuitable: quantity	Unsuitable: fines	Unsuitable: fines
Road Subgrade	Poor: large fragments	Fair	Good	Poor: shallow	Fair	Unsuitable: boulders
Revegetation Potential	Poor	Fair	Fair	Poor	Poor	Poor

To better characterize the soils on Forest lands (i.e., the portion of the project area not covered by USDA-SCS 1971), soil observation pits were excavated along this portion of the access route. The soils were observed to be deep with a typical sandy loam texture and a high coarse fragment content consisting primarily of granitics. Topsoil was observed to be 6 to 12 inches deep. Soil samples gathered at these observation points were analyzed for texture, coarse fragment content, organic material, lime, pH, salinity, phosphorus, potassium, and nitrate-nitrogen. Coarse fragment content (larger than 2 mm, excluding cobbles and boulders) and organic material content of the samples averaged 40 percent and 7 percent, respectively. The actual coarse fragment content is slightly higher since cobbles and boulders were excluded from the samples to facilitate analysis. No lime was detected; pH ranged from 6.0 to 6.4 and averaged 6.2; salinity ranged from 0.2 to 0.3 mmhos/cm and averaged 0.3 mmhos/cm. Phosphorus, potassium, and nitrate-nitrogen content ranged from 6.4 to 12.0 ppm, 307 ppm to 375 ppm, and 2.5 to 9.4 ppm, respectively, and averaged 8.3 ppm, 350 ppm, and 5.8 ppm, respectively. The analysis indicated poor soil fertility due to low phosphorus and nitrate-nitrogen content. The high coarse fragment content also lowers the utility of the soil for reclamation. Erosion hazard along this portion of the access route is slight to moderate. These observations and results of sample analysis verified the soil mapping unit extrapolation to the Forest lands.

From the end of the existing unimproved road to the drill site, new access road will be constructed across steep slopes that average 50 percent and have sections up to 60 percent at elevations from 6,800 feet to 7,000 feet over a length of approximately 800 feet. This portion of the access route segment has a moderate to high stability hazard due to the steep sideslopes. Depth to bedrock is shallow along this portion of the access route. The characteristics of soil on this section of new access road correlate most closely with the Windham and Rentsac series. Rentsac soils are shallow and well-drained; formed in calcareous loamy material weathered from calcareous sandstone, limestone, and dolomite; and have a channery loam texture. Runoff is moderate, erosion hazard is moderate, and depth to groundwater is deep. Existing erosion condition is stable. Permeability is moderately rapid, and pH ranges from 7.9 to 8.4. This soil has poor road subgrade suitability. Soil observation pits were excavated along this portion of the access route. A highly weathered calcareous sandstone was encountered at a depth of approximately 30 inches. Soil texture was a sandy loam with high coarse fragment content. Topsoil was observed to be 6 to 12 inches deep. Soil samples gathered at these observation points were analyzed for texture, coarse fragment content, organic material, lime, pH, salinity, phosphorus, potassium, and nitrate-nitrogen. The sample analysis indicated very similar characteristics to the results presented above. The high coarse fragment content also lowers the utility of the soil for reclamation. Erosion hazard along this portion of the access route is slight to moderate.

In addition to the proposed access route, three access route variations to the proposed drill site have been identified by the BLM and FS for consideration. These routes were described in detail in the Transportation section of this chapter and are shown on Exhibit 3-2. Access route Variations A2 and A3 utilize existing improved and unimproved two-track roads on the glacial and alluvial plains, terraces, and bottomlands to the east of the Forest boundary. Soils in this area have been described and mapped by the SCS (USDA-SCS 1971). Both access routes traverse the same soil mapping units described for the proposed access route (Variation A1). According to the SCS (Labruska 1989), soils along access route Variation A4 have not been formally mapped or described. The same landforms, topography, and parent materials that occur along Variations A1, A2, and A3 are also present along this variation. Therefore, the soils along this variation are expected to be very similar to those discussed for the other access route variations. According to Labruska (1989), no prime farmlands or farmlands of state and local importance occur along this access route.

3.3.2.2 Drill Site

3.3.2.2.1 Proposed Drill Site

The proposed drill site is located on a saddle of a small ridge that extends southeast from the midslopes of Line Creek Plateau near the transition zone between sedimentary rocks such as Big Horn dolomite and the Precambrian granitics. The ridge truncates

approximately 1,000 feet to the east of the drill site close to the end of the existing unimproved road. The saddle is roughly a 250- by 300-foot area that slopes to the northeast through southeast. The slope varies from 15 to 30 percent and averages 20 percent. The saddle is at an elevation of 7,000 feet.

Soil at the drill site is shallow, skeletal, sandy loam and sandy clay loam derived from deep granitic alluvium and colluvium over a sandstone, limestone, or dolomite bedrock. The depth to bedrock is shallow. The soil characteristics correlate most closely with those of the Stecum series as described by USDA-FS (1977) due to the predominant influence of the granitics. Erosion hazard at the drill site is slight. Existing erosion condition is stable. Exposed small boulders and cobbles cover approximately 10 percent of the soil surface. Runoff is slight, permeability is rapid, and depth to groundwater is deep.

Three soil observation pits were excavated at the drill site and revealed a skeletal coarse sandy loam to 18 inches at which point high cobble and boulder content precluded deeper excavation. Approximately 6 to 12 inches of topsoil exists over the drill site. Two soil samples gathered from each observation pit were analyzed for texture, coarse fragment content, organic material, lime, pH, salinity, phosphorus, potassium, and nitrates. Coarse fragment content (larger than 2 mm, excluding cobbles and boulders) and organic material content in the samples averaged 49 percent and 6 percent, respectively. The actual coarse fragment content is slightly higher since cobbles and gravels were excluded from the samples to facilitate analysis. There was no lime detected in any of the samples; pH ranged from 5.9 to 6.3 and averaged 6.1; salinity ranged from 0.2 to 0.4 mmhos/cm and averaged 0.3 mmhos/cm. Phosphorus and nitrate-nitrogen content ranged from 1.9 to 19.0 ppm and 3.4 to 6.4 ppm, respectively, and averaged 9.6 ppm and 4.8 ppm, respectively. Potassium content was greater than 400 ppm for five of the samples and 317 ppm for one sample. The analysis indicated poor soil fertility due to low phosphorus and nitrate-nitrogen content. The high coarse fragment content also lowers the utility of the soil for reclamation.

3.3.2.2.2 Alternative A Drill Site Variation

The Alternative A Drill Site Variation is located on an alluvial bench between two forks of the Ruby Creek, approximately 2,100 feet east and 500 feet below the saddle where the proposed Ruby Creek drill site is located. The slope of the alluvial bench is approximately 15 percent. Surface elevation of the Alternative A Drill Site Variation is 6,500 feet.

The Alternative A Drill Site Variation well would be directionally drilled to a bottom-hole location approximately 5,800 feet northwest of the drill site. The subsurface geology encountered during drilling would be similar to that described for the proposed drill site.

Soils at the Alternative A Drill Site Variation were derived from a combination of glacial outwash, colluvium, and alluvium. The soils are deep with a typical sandy loam texture, and a high coarse fragment content consisting primarily of granitics. Topsoil is 6 to 12 inches deep. Coarse fragment content, lime, ph, salinity, phosphorous, potassium, and nitrate-nitrogen values are characteristic of the soils along the access road on Forest land and described for the Alternative A - Proposed action access route. Poor soil fertility due to low phosphorous and nitrate-nitrogen content and a high coarse fragment content lowers the utility of the soil for reclamation.

3.3.3 Alternative B - Gold Creek Site

3.3.3.1 Access Route

As this access route is very similar to the Alternative A access route, the discussion for Alternative A applies to this alternative. Access to the Alternative B drill site follows the same route along the county road as Alternative A. From the end of the county road, this access route follows approximately 5.3 miles of existing unimproved two-track roads to the abandoned Amoco drill site (see Exhibits 2-2 and 2-3). Elevations along this route range from 4,300 feet to 5,900 feet. The majority of the soils that this access route traverses include the Romberg soils as discussed under Alternative A.

In the last one-half mile to the abandoned Amoco drill site and Forest boundary, the

access route leaves the Romberg soils and crosses strongly sloping Windham cobbly clay loam to the north of Gold Creek. The characteristics of Windham soil are discussed under Alternative A. This soil has the same increasing granitic influence higher on the slope as the section of Windham series soil beyond the Forest boundary as discussed under Alternative A.

From the Forest boundary, this route climbs the 15 to 20 percent slope from 6,400 feet to 6,940 feet along Gold Creek. The soil characteristics along this section of the access route correlate most closely with the Como series as described by USDA-SCS (1977). The Como series is moderately deep to deep, well-drained, very bouldery loam and very bouldery sandy loam formed in granitic glacial till and outwash terraces overlying limestone. Cobbles and boulders in this soil are granitic. The soil contains 20 percent to 60 percent rock fragments, with boulders ranging in size from one foot to six feet in diameter. This soil has slow to moderate runoff potential, low erosion hazard, rapid permeability, low shrink/swell potential, and greater than six feet to the water table. The soil is a poor source of topsoil and road subgrade due to high coarse fragment contents consisting of large cobbles and boulders. The soil along this section of road has a low stability hazard. Although no soil samples were collected along this section of the road, samples taken at the drill site were very similar and therefore representative of the new access road.

3.3.3.2 Drill Site

The drill site is located at 6,940 feet on a 20 percent slope with uniform smooth topography. The drill site area is covered with large granitic boulders ranging in size from one to over six feet in diameter. Cumulatively, these boulders cover over 10 to 20 percent of the area. The soil characteristics at the drill site (and along the last section of access road) correlate most closely with the Como series as described above. Three soil observation pits were excavated and soils observed to be skeletal coarse sandy loams to 12 inches at which point the high content of cobbles and boulders precluded deeper observation. Two soil samples gathered from each pit were analyzed for texture, coarse fragment content, organic material, lime, pH, salinity, phosphorus, potassium, and nitrate-nitrogen. Coarse fragment content (larger than 2 mm, excluding cobbles and boulders) and organic material content averaged 32 percent and 5 percent, respectively. The actual coarse fragment content is slightly higher since cobbles and boulders were excluded from the samples to facilitate analysis. No lime was detected; pH ranged from 5.9 to 6.3 and averaged 6.0; salinity ranged from 0.1 to 0.3 mmhos/cm and averaged 0.2 mmhos/cm. Phosphorus, potassium, and nitrate-nitrogen content ranged from 3.7 to 5.9 ppm, 275 ppm to 354 ppm, and 0.7 to 4.7 ppm, respectively, and averaged 5.0 ppm, 307 ppm, and 2.8 ppm, respectively. Existing erosion condition is stable. The analysis indicated poor soil fertility due to low phosphorus and nitrate-nitrogen content. The high coarse fragment content also lowers the utility of the soil for reclamation.

3.4 WATER RESOURCES

3.4.1 Introduction

The project area lies in several intermittent to perennial stream watersheds on the east side of the Line Creek Plateau including Grove, Dilworth, Gold, Ruby, and Mill creeks. All surface drainage is east to the Clarks Fork of the Yellowstone River. Due to its mountainous location and high elevation, the project area receives the majority of its precipitation in the form of snow from November through April. Thunderstorms provide a moderate amount of additional precipitation during the remainder of the year. Although the project area lies in a precipitation shadow on the east side of the Line Creek Plateau and Beartooth Mountains, the higher elevations (8,000 to 9,000 feet) of the project area receive an annual average of approximately 30 to 40 inches of precipitation while lower to mid-elevations (4,000 to 8,000 feet) receive 20 to 30 inches of precipitation (USDA-FS 1978). The upper reaches of the project area receive an average annual maximum snow accumulation of up to 60 inches and an average maximum snow water equivalence of 20 inches, which generally occurs in April (USDA-FS 1977, 1978 and USDA-SCS 1983). The lower portion of the project area receives considerably less snowfall.

3.4.1.1 Surface Water

There is minimal information on surface water resources in the project area. None of

the streams previously listed have been or are currently gaged. The closest gages are on Rock Creek near Red Lodge and on the Clarks Fork of the Yellowstone River. The streams in the project area are intermittent in space; that is, certain reaches of the same stream contain perennial flow while others do not. Most of the flow contained in the streams is the result of base flow from the inflow of groundwater and springs. The flow regimes of the streams in the project area are relatively placid in that there is little variation in the quantity of flow during the year. The minimal flow variations during the year are in response to snowmelt as well as from rainstorms. Snowmelt commences in mid-April and continues through June. Peak flows generally occur in mid-May to early June in response to snowmelt (USDA-FS 1978). Baseflows resulting from groundwater inflow occur from September through March. Other increases in streamflows occur in response to thunderstorms primarily during the summer and fall months.

There are no comprehensive water quality data for the streams in the project area. USDA-FS (1978) indicates that both Ruby and Gold creeks are medium hard (i.e., 61 to 120 mg/l $CaCO_2$) while Line Creek is hard (over 120 mg/l). Although Ruby and Gold creeks are perennial in the upper portion of the project area, their flow characteristics are not conducive to a game fishery. Since the headwaters of the streams are located at relatively high elevations in areas that have not been adversely affected by management or development, water quality is expected to be good to excellent for culinary, livestock, and agricultural uses. Water quality data for the Clarks Fork (USDI-USGS 1986) indicate few or no problems with surface water relative to these uses.

According to the Montana Department of Fish, Wildlife and Parks (MDFWP), there are no records of these streams containing game fish (Darling 1989). Within the perennial reaches of these streams, flow discharges range from 0.5 to 1.0 cubic feet per second (cfs). This minimal flow combined with relatively high channel gradients, large cobbles and boulders, and high flow energies minimize potential fishery habitat. Further, these perennial reaches do not have surface water communication with the Clarks Fork, which is considered a good fishery, thereby precluding fish migration from the Clarks Fork to Ruby and Gold creeks.

3.4.1.2 Groundwater

Similar to surface water, there is minimal information on groundwater resources within the project area. Groundwater is expected to be contained within most of the geologic strata in the area and also in alluvium associated with streams. Except for the alluvium, minimal quantities of groundwater likely occur in the massive and unfractured granitics of the Line Creek Plateau and the upturned sedimentary rocks on the plateau's eastern margin. Where groundwater does occur within these units, it is likely restricted to fracture zones and faults. Springs and seeps typically occur where these features intersect the land surface. Relatively large quantities of easily extracted groundwater are contained in the alluvium associated with the streams in the area, as well as the glacial outwash plains. Groundwater quality is likely to be good to excellent relative to culinary, livestock, and industrial uses.

The hydrogeologic characteristics of the sedimentary units below the surface of the project area are not specifically known. The occurrence of aquifers and groundwater can be highly site-specific both vertically and laterally within the predominantly sedimentary units. All or portions of all units could potentially contain groundwater of varying quantities, yields, and quality.

3.4.1.3 Water Rights and Claims

There are numerous surface water and groundwater rights and claims in the project area. According to Kuehn (1988), the State of Montana is currently undergoing a general adjudication of existing (pre-July 1, 1973) rights; therefore, the legal nature of each claim or right is uncertain. There are approximately 23 surface water rights and 15 groundwater rights located in the project area, primarily in its eastern portion. Most of these are for stock and wildlife watering, irrigation, and domestic uses. Most of the surface water rights are on Grove Creek with some on Gold, Ruby, and Mill Draw creeks. Many of the groundwater rights are on existing springs such as Tolman Cemetery Spring, Corner Spring, and Three Corner Springs. The several wells in the project area obtain

groundwater from the relatively shallow alluvial aquifers contained in the glacial outwash and along stream courses.

3.4.2 Alternative A - Proposed Action

3.4.2.1 Access Route

Access to the drill site would utilize the existing improved Grove Creek Road for five miles. This road crosses Grove Creek. From the end of the county road, access would utilize unimproved roads to the Forest boundary that cross several unnamed intermittent and ephemeral stream channels, including Dilworth Creek and tributaries to Mill Draw Creek.

Approximately 1.2 miles east of the Forest boundary, the access road converges on Ruby Creek. The road parallels Ruby Creek adjacent to but out of the riparian zone for approximately 2.0 miles. This segment of Ruby Creek contains perennial flow and has a well-developed riparian zone as described in the Vegetation Section. The stream is incised approximately 5 to 15 feet below its floodplain and therefore has steep banks. Most of the riparian vegetation is contained within the incised banks. The channel bed consists of gravels, cobbles, and small boulders up to 18 inches in diameter. The average channel gradient is approximately 10 percent. As discussed previously, the stream has a relatively placid flow regime as evidenced by vegetation covered banks down to the water level associated with base flow conditions and by moss covered rocks and debris within the active channel. The stream is supported by small seeps and springs along its course as well as from groundwater inflow from shallow alluvial aquifers. The existing unimproved road crosses Ruby Creek once with a low water crossing approximately 0.3 miles above the Forest boundary. The road parallels the northern fork of the stream above this crossing. During early October 1988, the stream at this point was observed to flow with approximately 0.5 cubic feet per second (cfs). As indicated previously, peak flows do not appear to significantly exceed baseflows since the source of the stream is primarily groundwater inflow. Most surface water generated from snowmelt quickly percolates into the highly permeable alluvial and glacial deposits contained in the Ruby Creek canyon.

There are three water right claims along Ruby Creek just below the Forest boundary. These include two wells (Norman Frisbie, owner) and one surface water diversion from Ruby Creek (Sun Dial Land Company, Inc.) all located in the N1/2 of Sec 14 T9S R20E.

In addition to the proposed access route, three access route variations to the proposed drill site have been identified by the BLM and FS for consideration. These routes were described in detail in the Transportation Section of this chapter and are shown on Exhibit 3-2. Access route Variation A2 would utilize the county Grove Creek Road to its terminus, and cross Grove Creek as described previously. From the Gold Creek Road terminus, the route ties into the Meeteetse Trail road and follows this road to the Robertson Draw Road. The Meeteetse Trail road crosses the intermittent Dilworth Creek and Mill Draw within one mile of the Clarks Fork river. The route follows the Robertson Draw Road for approximately five miles. This improved county road closely parallels an unnamed ephemeral to intermittent stream for this distance. This route follows an unimproved two-track road to Mill Creek where the route converges with the proposed access route (Variation A1). Several small ephemeral channels would be crossed on this segment of unimproved two-track road. Variation A2 follows the same route as Variation A1 to the proposed drill site from this point of convergence.

Access route variation A3 would utilize 1.5 miles of a county improved two lane road from Highway 72 to the Robertson Draw Road. This segment of the route crosses the Clarks Fork by a steel truss bridge previously described in the Transportation Section of this chapter. The rest of this variation would utilize the same route as described for Variation A2. Access route Variation A4 would utilize paved Park County roads and unimproved two-track roads to access the Robertson Draw Road previously described (Exhibit 3-2). This segment of the route crosses the perennial Bennett and Line creeks. Upon reaching the Robertson Draw Road, this variation would be the same as Variations A2 and A3 to the proposed drill site.

3.4.2.2 Drill Site

3.4.2.2.1 Proposed Drill Site

The drill site is located on a structural bench or ridge located approximately 250 feet above and 0.25 miles north of the main (south) fork of Ruby Creek. There are no stream channels or drainage ways in the immediate vicinity of the drill site. The site is well-drained with no evidence of shallow groundwater or seeps and springs. The closest water rights to this drill site are located approximately 1.3 miles east, and are the same as discussed for the access route.

3.4.2.2.2 Alternative A Drill Site Variation

The drill site is located on the gently sloping surface of the Ruby Creek valley bottom within 400 feet of both forks of the creek. The site is well-drained with no evidence of shallow groundwater or seeps and springs. The closest water rights to this drill site are located approximately 0.9 mile east, and are the same as those discussed for the proposed Ruby Creek drill site.

3.4.3 Alternative B - Gold Creek Site

3.4.3.1 Access Route

Access to the drill site would utilize the existing improved Grove Creek Road for five miles as discussed under Alternative A. From the end of the county road, access would utilize unimproved two-track roads that cross and parallel several unnamed ephemeral stream channels to reach the abandoned Amoco drill site. The access route converges and crosses Gold Creek approximately 0.4 miles and 0.8 miles below (east) the abandoned drill site and the Forest boundary, respectively. This upper segment of Gold Creek is very similar to that described for Ruby Creek. Upon crossing the creek, the route then diverges from the creek, traverses upland, and crosses two ephemeral tributaries to Gold Creek upon terminating at the abandoned drill site. From the abandoned Amoco drill site, the access route would again converge on and parallel Gold Creek for approximately 0.3 miles. At one point the access route would lie directly adjacent to the steep banks (70 percent) leading down to Gold Creek for approximately 100 feet. At this point the access route again diverges from Gold Creek and traverses 15 to 20 percent upland slopes to the drill site. The nearest water right to this upper segment of access route is a well in the SW1/4 of Sec 2 T9S R20E (Amoco Production Company, owner).

3.4.3.2 Drill Site

The drill site is located on a 15 to 20 percent slope with undulating topography covered with ground moraine. The site is approximately 0.2 miles north of Gold Creek. Several small swales that show no evidence of recent surface water flow traverse the drill site area. The site is well-drained with no evidence of shallow groundwater or seeps and springs. The closest water right to this drill site is located approximately 1.0 mile northeast and is the same as discussed for the access route.

3.5 VEGETATION, TIMBER, AND RANGE RESOURCES

3.5.1 Introduction

Vegetation of the project area is typical of the eastern flank of the Beartooth Mountains of the Middle Rocky Mountains Physiographic Province. The area is mountainous with steep, contrasting slopes that provide distinctly different and variable microclimates within a relatively small area. The highly variable slope position, aspect and gradient, and soil type typical of the area causes a great degree of variability in vegetation community or cover types and distribution of these types in the project area. The vegetation in the project area serves several functions including watershed stability, wildlife habitat and forage, livestock forage, visually pleasing landscapes, and recreation opportunities. Vegetation anchors and protects the soil to minimize erosion and detain moisture on the land, preventing excessive quantities of water runoff within a short period. The value of vegetation for wildlife forage and habitat is a major consideration in management of vegetation on wildlands as discussed in greater detail in the Wildlife Section. Vegetative form, texture, color, and pattern are important factors in defining the quality of landscapes and the settings for outdoor recreation as discussed in greater detail in the Visual Resources and Recreation Sections.

3.5.1.1 General Vegetation

Field reconnaissance during several site visits, aerial observation, and aerial photos were used to identify six distinct vegetation cover types. These include five upland types (sagebrush scrub, limber pine woodland, mixed conifer, alpine bunchgrass and forblands, and agricultural land) and one wetland type (riparian cottonwood and willow). In addition, several existing documents were used to provide additional descriptive information including USDA-FS (1977 and undated), Pfister et al. (1977), and Mueggler and Stewart (1980). Exhibit 3-3 and 3-4 show the distribution of these types in the project area and in the vicinity of the drill sites, respectively. Table 3-3 presents the frequency of occurrence of these types in both exhibits.

The sagebrush scrub type primarily occupies the terraces and plains at lower elevations (4,000 to 6,000 feet) on the east side of the project area. This type also extends up onto the toeslopes of the mountains to an elevation of approximately 7,000 feet where it occurs in a mosaic with the limber pine woodland and mixed conifer types. This type is dominated by a sparse to dense shrub layer with a relatively dense forb and grass understory. At lower elevations on the east side of the project area, this type is dominated by black sagebrush, low sagebrush, and antelope bitterbrush, and at higher elevations on the mountain toeslopes big sagebrush and rabbitbrush dominate. Typical understory species at lower elevations include blue grama, Indian ricegrass, needle-and-thread, western yarrow, Hood's phlox, pricklypear cactus, golden avens, hairy gold aster, cushion buckwheat, pale agoseris, silvery lupine, Indian paintbrush, rose pussytoes and fringed sagebrush. These understory species are replaced at higher elevations by bluebunch wheatgrass, Idaho fescue, sheep fescue, western wheatgrass, prairie junegrass, milkweed, and fleabane daisy. The overstory of lower elevational areas may also be dominated by greasewood in saline soils. This type corresponds to several climax community types described by Mueggler and Stewart (1980) and includes needle-and-thread/blue grama, bluebunch wheatgrass/blue grama, big sagebrush/Idaho fescue, big sagebrush/bluebunch wheatgrass, and antelope bitterbrush/Idaho fescue habitat types. This vegetation type primarily occurs off the Forest, corresponds to the grassland bench landtype (USDA-FS 1977), and is primarily managed for livestock and wildlife forage and habitat.

The limber pine woodland type occurs topographically and elevationally above the sagebrush scrub type and is characterized by a relatively sparse overstory (< 30 percent) consisting primarily of limber pine and minor amounts of Douglas-fir. This is a transitional type between the lower elevation sagebrush scrub and the higher elevation mixed conifer types. A sparse shrub layer typically occurs under the overstory and consists of big sagebrush, common juniper, horizontal juniper, Wood's rose, gooseberry currant, and mallow ninebark. Forb and graminoid species are similar to those described for the sagebrush scrub type at higher elevations. This type corresponds to the limber pine/Idaho fescue, limber pine/bluebunch wheatgrass, and limber pine/common juniper habitat types as described by Pfister et al. (1977). This type corresponds to the timber-grassland foothills and steep timber and grassland slopes landtypes (USDA-FS 1977) and is managed by the FS for wildlife habitat and forage, watershed stability, and recreation.

The mixed conifer vegetation type occupies the mid- to upper elevation portion of the eastern flank of the Beartooth Mountains above the sagebrush scrub and limber pine woodland types. This type is characterized by a dense (50 to 100 percent) conifer overstory on steep mountain slopes. At lower elevations (6,500 to 7,500 feet), the overstory is dominated by limber pine and Douglas-fir and corresponds to the limber pine habitat types and drier Douglas-fir habitats such as Douglas-fir/bluebunch wheatgrass and Idaho fescue habitat types as described by Pfister et al. (1977). At mid-elevations (7,500 to 8,500 feet), this type is dominated by Douglas-fir and corresponds to the Douglas-fir/mallow ninebark, common juniper, and elk sedge habitat types. At higher elevations (8,500 to 9,400 feet) this type is dominated by Douglas-fir, subalpine fir, lodgepole pine, and Engelmann spruce and corresponds to the subalpine fir/elk sedge, gooseberry currant, and grouse whortleberry habitat types. Whitebark pine dominates this type at the

Table 3-3. Vegetation Cover Types and Frequency of Occurrence within the Project Area and the Immediate Vicinity of the Drill Sites.

Vegetation Cover Type	Percent Frequency of Occurrence	
	Project Area	Project Vicinity
Sagebrush Scrub	68	10
Limber Pine Woodland	6	31
Mixed Conifer	7	51
Alpine Bunchgrass and Forbland	1	6
Riparian Cottonwood and Willow Scrub	5	2
Agricultural Land	13	0
TOTAL	100	100

highest elevations at the transition zone to the alpine ecosystem on the Line Creek Plateau where the trees are characteristically stunted and wind sculptured. At this elevation this type is dominated by the subalpine fir-whitebark pine habitat types. At lower to mid-elevations, a conspicuous understory shrub layer exists and consists of snowberry, ninebark, and common juniper, giving way to grouse whortleberry at higher elevations. At lower elevations, forb and graminoid species are similar to the limber pine woodland type. At higher elevations, sheep fescue, spike trisetum and Ross sedge dominate the understory. This vegetation type corresponds to the mountainous slopes and smooth mountain uplift landtypes (USDA-FS 1977) and is managed by the FS for wildlife habitat and forage, watershed stability, and recreation.

The alpine bunchgrass and forbland vegetation type as defined by USDA-FS (1980b) occurs above the mixed conifer type on the Line Creek Plateau at an elevation of 9,400 feet. This type is characterized by a low (< 1 foot) growth habit consisting of alpine bunchgrasses and forbs, and in harsher areas cushion plants. Forb and graminoid species include dryas, moss silene, yellow avens, varileaf cinquefoil, curly sedge, spike trisetum, sheep fescue, alpine timothy, and alpine bluegrass. This vegetation type corresponds to the alpine turfs landtype (USDA-FS 1977) and is primarily managed for wildlife forage and habitat, watershed, and recreation.

The agricultural land occurs primarily on the alluvial bottomlands and toe slopes associated with the Clarks Fork. Crops such as alfalfa, pasture hay, row crops, and small grains are produced on these lands.

The riparian cottonwood and willow scrub vegetation type occurs in narrow bands along perennial and intermittent stream drainages at mid- to low elevations (7,500 to 4,000 feet) within the project area. This type is generally discontinuous along the drainages due to the highly permeable alluvium and glacial outwash that contain the stream channels and the intermittent flow characteristic of the streams. A dense overstory is dominated by black cottonwood, narrowleaf cottonwood, aspen, thinleaf alder, and water birch. A sparse to dense shrub layer is typical and consists of red osier dogwood, currant, Wood's rose, black hawthorn, sandbar willow, and Bebb willow. A dense forb and graminoid ground cover exists and includes tufted hairgrass, redtop bentgrass, horsetail, wire rush, and various sedges. This vegetation type is primarily managed for wildlife forage and habitat, watershed, and recreation, and livestock grazing off-Forest.

Although these cover types are relatively common in the region, the plant associations, landforms, and landscapes are unusual. As such, the Wyoming/Montana Nature Conservancy has recently proposed the Meeteetse Spires Nature Preserve in an area just north of the project area. The proposed

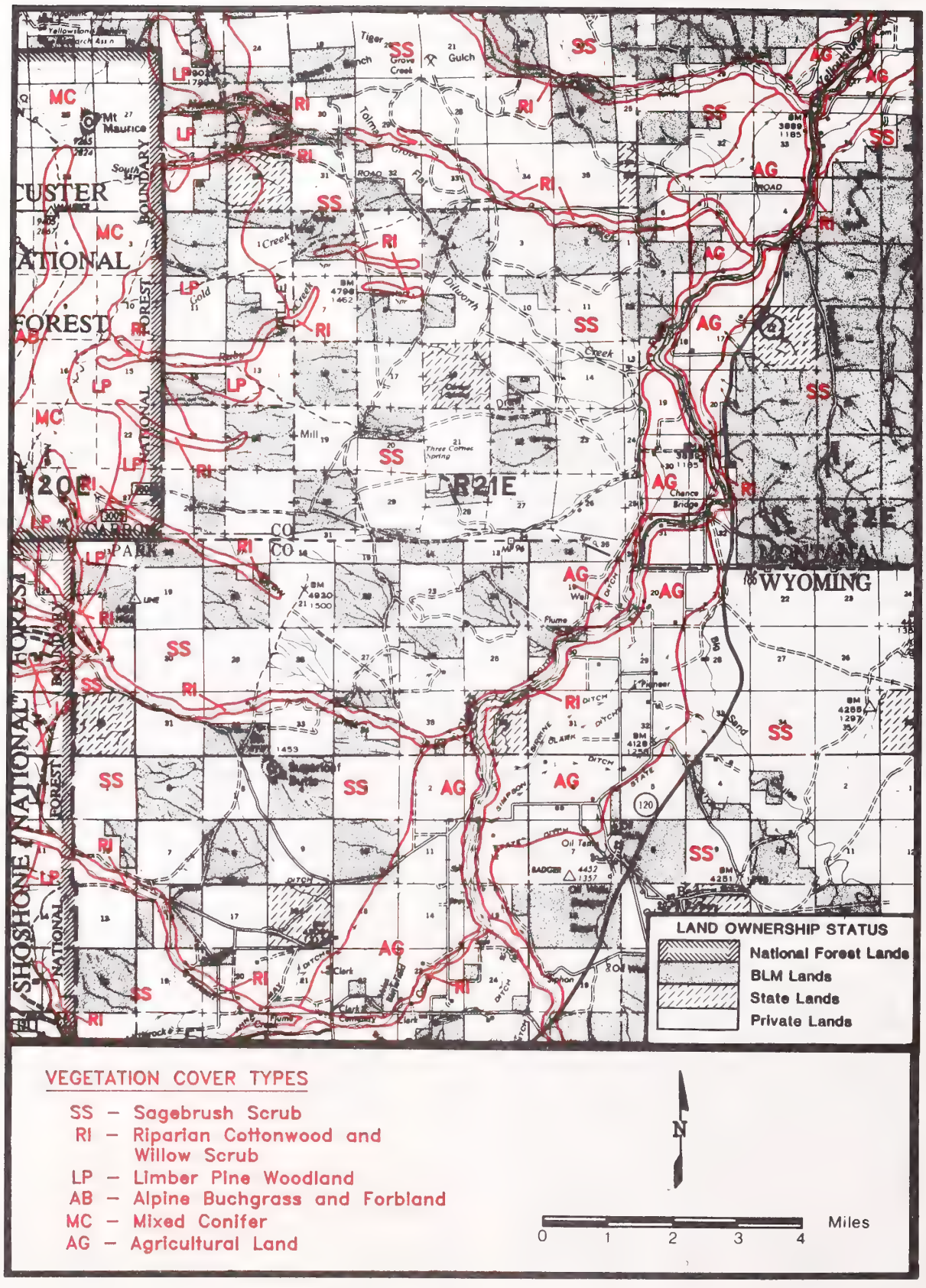

Exhibit 3-3. Vegetation Cover Types in the Ruby A Federal No. 1-9 Project Area.

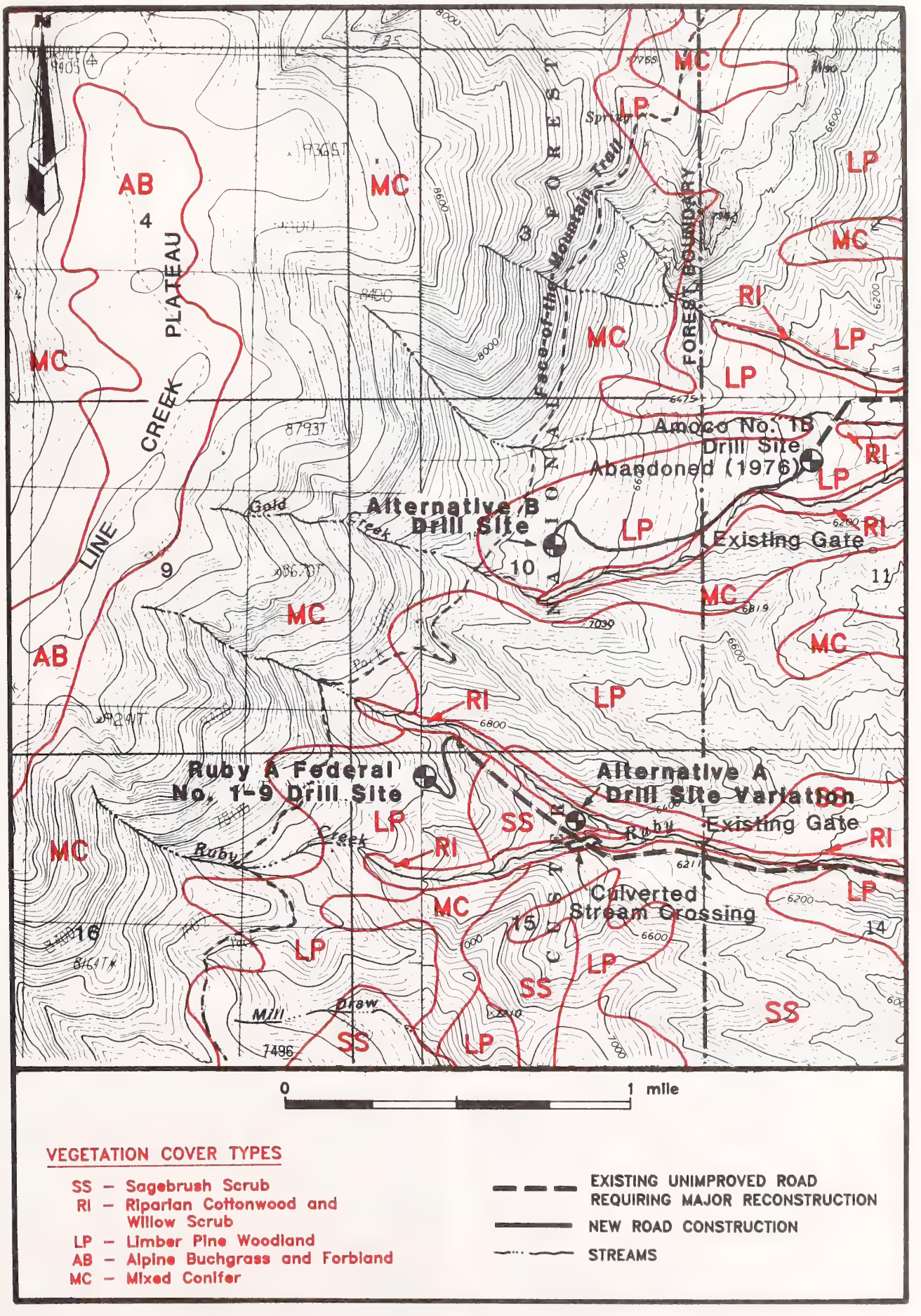

Exhibit 3-4. Vegetation Cover Types in the Immediate Vicinity of the Ruby A Federal No. 1-9 Project.

preserve would encompass a large portion of the Grove Creek drainage, which exhibits unique plant associations and visually interesting palisades or Meeteetse Spires (Lesica 1988).

3.5.1.2 Noxious Weeds

Undesirable plants such as noxious weeds are also part of the vegetative environment of the project area. The Custer National Forest has prepared a noxious weed treatment program and environmental impact statement for program implementation (USDA-FS 1986b). The Custer National Forest has identified nine noxious weed species that are of concern to the FS: leafy spurge, spotted knapweed, Canada thistle, hemp, Russian knapweed, dalmatian toadflax, wormwood, sowthistle, and St. Johnswort. These species are also of concern on non-Forest lands. The Custer National Forest inventoried the Beartooth Ranger District for noxious weeds in 1985 and found approximately 3 acres of leafy spurge, 114 acres of spotted knapweed, and 12 acres of dalmatian toadflax. The occurrence of noxious weeds is directly related to soil disturbance associated with development and resource utilization. *No invasion of noxious weeds was observed in the project area during field visits in 1988 and 1989.*

3.5.1.3 Plant Species of Special Concern

Plant species of concern include species listed as threatened or endangered under the federal Endangered Species Act, species proposed for federal listing, candidate species under consideration for federal listing, and other species of concern to the Montana Natural Heritage Program (MTNHP). According to the MTNHP (Shepperd 1988) there are 16 plant species of concern in the vicinity of the proposed project. None of these are federally listed, and only three have candidate status for federal listing. Table 3-4 lists these species, their status, habitat, and nearest location to the project area. Most of these species (9) exploit habitat in the alpine bunchgrass and forblands vegetation cover type located above and west of the immediate project area. The other species of concern (7) occur to the north and northeast in sagebrush scrub or limber pine woodland cover types, or southwest in the mixed conifer cover type. *A field survey for these plants was accomplished in July, 1989 along all project components (Grah and Smith 1989). Only one of the species itemized in Table 3-4, bird's foot sagebrush, was found in the immediate vicinity of the project in the eastern portion of the project area as discussed in subsequent sections.*

3.5.1.4 Wetlands

Wetlands are defined as "those areas that are inundated or saturated with surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (Federal Register 1986). *Wetlands receive special administrative attention for several reasons. Wetlands are considered to be "waters of the United States" and as such, activities that involve discharge of pollutants into wetlands are regulated under the Federal Clean Water Act.* The Department of Army Corps of Engineers (COE) through the Section 404 guidelines and permitting process has the administrative authority to regulate activities that *involve discharge of dredge or fill material into* waters of the United States and their associated wetlands (adjacent and isolated wetlands). *The U. S. Environmental Protection Agency also regulates activities that involve disturbance of and discharge of pollutants into wetlands.* To qualify for administrative consideration under the federal program, a wetland must meet all three of the criteria used to positively determine the existence of a wetland (*Federal Interagency Committee for Wetland Delineation 1989*): 1) the presence of hydrophytic plants, 2) the presence of hydric soils, and 3) the presence of surface or subsurface water to support 1 and 2 (above). Wetlands have gained considerable recognition for their functional value in both biological and physical systems. These functions include groundwater discharge and recharge, flood storage and desynchronization, shoreline anchoring and dissipation of erosive forces, sediment trapping, nutrient retention and removal, food chain support, wildlife and fish habitat, and active and passive recreation and heritage value (Adamus and Stockwell 1983). Wetlands within the project area primarily include riparian zones along the perennial and intermittent drainages such as Ruby Creek and Gold Creek. The distribution of the riparian cottonwood and willow scrub wetland within the project area is shown on Exhibits 3-3 and 3-4.

3.5.1.5 Grazing and Timber Management

There are no intensively managed timber stands on lands administered by the FS (USDA-FS 1986a and 1987b) or the BLM (USDI-BLM 1983) in the immediate vicinity of the project area; therefore, no timber harvests are planned in the limber pine and mixed conifer types in the project area. Only one grazing allotment, the Grove Creek allotment, occurs on BLM-administered land and adjacent private and State land to the east of the Forest boundary (USDI-BLM 1983). This allotment contains 9,173 acres of BLM-administered land and 14,334 acres of private land. This cattle allotment is divided into four discrete pastures and managed on a rest rotation system. The allotment is used year-round. The BLM portion of the allotment provides 1,295 animal unit months (AUMs) for an average of approximately seven acres per AUM (USDI-BLM 1983). Only 581 AUMs are currently utilized. Approximately 59 percent of the allotment is in excellent to good condition and the overall trend is static. There are no allotments or livestock grazing on lands administered by the FS in the immediate vicinity of the project area (USDA-FS 1987b).

3.5.2 Alternative A - Proposed Action

3.5.2.1 Access Route

Access would utilize existing roads to within 0.3 miles of the proposed drill site. Initially from State Highway 72, the access route traverses agricultural land for the first two miles. Upon leaving the agricultural land, the access route traverses approximately 11 miles of sagebrush scrub vegetation on glacial outwash plains, fans, and terraces. The last mile of access route traverses limber pine woodland. The access route parallels the riparian zone associated with Ruby Creek for approximately three miles and crosses the creek near the terminus of the existing unimproved road. *Survey of this access route for plant species of concern in July, 1989 (Grah and Smith 1989) located one population of bird's foot sagebrush along the margin of the existing road near the terminus of the Grove Creek Road. Several ninebark (Physocarpus) bushes were identified along the upper reaches of this access route near the proposed drill site. These specimens exhibited morphologic characteristics of both the common species (Physocarpus malvaceous) and the rare species (Physocarpus monogynus). Close examination of both morphology, growth habit, and habitat indicated a strong tendency toward the more common species. No other plant species of concern were identified during the field survey.* The access route traverses the Grove Creek allotment that was described previously.

In addition to the proposed access route, three access route variations to the proposed drill site have been identified by the BLM and FS for consideration. These routes were described in detail in the Transportation Section of this chapter and are shown on Exhibit 3-2. Access route Variation A2 traverses sagebrush scrub from its deviation from the Grove Creek Road to its confluence with Variation A1 near Mill Draw. Vegetation along this variation is the same as described for Variation A1. Access route Variation A3 initially crosses approximately 1.5 miles of agricultural land on the alluvial bottomlands along the Clarks Fork. Minimal riparian vegetation lines the bank of the river at this point. Upon reaching the Robertson Draw Road, this variation crosses sagebrush scrub as described previously for Variation A2. Variation A4 traverses approximately five miles of agricultural land from Highway 120 to the beginning of the unimproved two-track road.

In addition, narrow bands of riparian vegetation associated with Bennett Creek would be crossed. The unimproved two-track road crosses sagebrush scrub and a narrow zone of riparian vegetation associated with Line Creek to its terminus with the Robertson Draw Road. From this point, Variation A4 is the same as Variations A1, A2, and A3 to the drill site. *Survey of the variation access routes for plant species of concern in July, 1989 (Grah and Smith 1989) located several populations of bird's foot sagebrush along the margin of the existing roads from near the terminus of the Grove Creek Road south to the Meeteetse Trail (Variations A1 and A2), south along the Meeteetse Trail (Variation A2) to the Robertson Draw Road, and west along the Robertson Draw Road (Variation A3).*

3.5.2.2 Drill Site

3.5.2.2.1 Proposed Drill Site

The proposed drill site is located on a sagebrush scrub opening on a structural bench within the limber pine woodland

Table 3-4. Plant Species of Special Concern within a 15-mile Radius of the Ruby A Federal No. 1-9 Project.

Common Name	Scientific Name	Status Fed[a]	Status State[b]	Habitat	Nearest Location
Bird's foot sagebrush	*Artemisia pedatifida*	none	G3S2	Missouri breaks, sagebrush and limber pine at 5,670 feet.	5 mi. E
Porsild's draba	*Draba porsildii*	none	GUS1	Alpine bunchgrass and forblands vegetation cover type from 9,000 to over 11,000 feet.	10 mi. W
Pretty daisy	*Erigeron formosissimus*	none	GUSU	Mountain brush, sagebrush, limber pine, meadows, and aspen at 5,760 feet.	14 mi. NNW
Torrey bitterweed	*Hymenoxys torreyana*	none	GUS1	Limber pine woodland at 7,100 feet.	5 mi. NNE
Kobresia	*Kobresia macrocarpa*	none	G5S1	Mossy bog in alpine bunchgrass and forbland vegetation cover type at 9,800 feet on Line Creek Plateau.	7 mi. W
Island koenigia	*Koenigia islandica*	none	G4S2	Alpine bunchgrass and forbland vegetation cover type at 9,800 feet on Line Creek Plateau.	7 mi. WSW
Alpine poppy	*Papaver kluanensis*	none	GUS1	Alpine bunchgrass and forbland vegetation cover type at 11,000 feet.	15 mi. W
Oeder's lousewort	*Pedicularis oederi*	none	GUS2	Bog marginal to a lake within alpine bunchgrass and forbland on the Line Creek Plateau at 9,000 feet.	6 mi. WSW
Ice grass	*Phippsia algida*	C3	G5S1	Alpine bunchgrass and forbland vegetation cover type at 9,800 feet on the Line Creek Plateau.	6 mi. WSW
Mountain ninebark	*Physocarpus monogynus*	none	G2SU	Limber pine woodland at 6,500 feet.	4 mi. NNE

Table 3-4. Continued.

Common Name	Scientific Name	Status Fed[a]	Status State[b]	Habitat	Nearest Location
Barratt's willow	*Salix barrattiana*	none	G3S1	Alpine bunchgrass and forbland vegatation cover type at 10,000 feet on the Line Creek Plateau.	7 mi. SSW
Golden saxifrage	*Saxifraga chrysantha*	none	GUS1	Alpine bunchgrass and forbland at 11,360 feet.	15 mi. W
Alpine groundsel	*Senecio amplectans*	none	GUS1	On granitic talus within limber pine and mixed conifer at 7,700 feet.	14 mi. SW
Twice-hairy butterweed	*Senecio fuscatus*	none	G4S2	Alpine bunchgrass and forbland at 10,200 feet.	9 mi. SW
Shoshonea	*Shoshonea pulvinata*	C2	G3S1	Limber pine woodland on limestone soils at 7,100 feet.	3 mi. NNE
Sword townsendia	*Townsendia spathulata*	C3	G3S2	Limber pine woodland on limestone soils at 6,200 feet.	3 mi. NNE

a - Federal Status:

C2 - threat and/or distribution data are insufficient to support federal listing.
C3 - threat and/or distribution data are sufficient to indicate that federal listing is not warranted.

b - State Status:

Global Rank
G1 - Critically imperiled globally because of extreme rarity (5 or fewer occurrences, or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extinction. (Critically endangered throughout range).
G2 - Imperiled globally because of rarity (6 to 20 occurrences) or because of other factors demonstrably making it very vulnerable to extinction throughout its range. (Endangered throughout range).
G3 - Either very rare and local throughout its range or found locally (even abundant at some of its locations) in a restricted range, or because of other factors making it vulnerable to extinction throughout its range; in the range of 21 to 100 occurrences. (Threatened throughout range).
G4 - Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.
GU - Possibly in peril range-wide, but status uncertain; more information needed.

State Rank
S1 - Critically imperiled in Montana because of extreme rarity (5 or fewer occurrences, or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extirpation from the state. (Critically endangered in state).
S2 - Imperiled in Montana because of rarity (6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extirpation from the state. (Endangered in state).
SU - Possibly in peril in Montana, but status uncertain; more information needed.

Source: MTNHP 1988

vegetation cover type. Half of the drill site area is covered by a grass dominated layer, while the other half is dominated by big sagebrush. Two 100-foot transects were established across the drill site to quantitatively determine predisturbance conditions. The transects indicated that approximately 32 percent of the area was covered by grass, 32 percent by shrubs or sub-shrubs, 11 percent by forbs, 7 percent by moss and/or cryptogamic crust, 3 percent bare soil, 3 percent rock and 12 percent litter. Predominant grass species included sheep fescue, Idaho fescue, bluegrass, and prairie junegrass. Shrub species included big sagebrush, rabbitbrush, and common juniper. Forb species included lupine, yarrow, Hood's phlox, fleabane daisy, and cymopterus. Overstory canopy cover ranges from 30 to 60 percent in the surrounding stands of limber pine. None of the species of special concern listed in Table 3-4 were identified at the drill site *during the field survey conducted in July, 1989.*

3.5.2.2.2 Alternative A Drill Site Variation

The Alternative A Drill Site Variation is located in a mosaic of sagebrush scrub, limber pine woodland, and cottonwood and willow riparian vegetation community types; however, the predominant type involved is the sagebrush scrub type. Vegetation structure and species composition at this site is similar to the proposed drill site. Wetlands comprised of the cottonwood and willow riparian occur along the forks of Ruby Creek, each located approximately 400 feet from the drill site. None of the species of special concern listed in Table 3-4 were identified at the drill site during the field survey conducted in July, 1989. Although, the same detailed scrutiny was given ninebark bushes in the vicinity of the drill site with the same results described for the proposed drill site.

3.5.3 Alternative B - Gold Creek Site

3.5.3.1 Access Route

Vegetation resources along this access route are very similar to that described for Alternative A. Access would utilize existing roads to within 0.8 miles of the proposed drill site. Initially from State Highway 72, the access route traverses agricultural land. Upon leaving the agricultural land for the first 2.0 miles, the access route traverses approximately 7.0 miles of sagebrush scrub vegetation on glacial outwash plains, fans, and terraces. The last 2.0 miles of access route traverses limber pine woodland. The access route crosses Gold Creek and parallels the riparian zone associated with Gold Creek for approximately 0.5 miles. *None of the species of special concern listed in Table 3-4 were identified at the drill site during the field survey conducted in July, 1989. Although, the same detailed scrutiny was given ninebark bushes in the upper reaches of this access route in the vicinity of the Gold Creek drill site with the same results described for the proposed drill site.* The access route traverses the Grove Creek allotment that was described previously.

3.5.3.2 Drill Site

This drill site is located on deep ground moraine covered with limber pine woodland vegetation cover type. The general drill site area is covered by an overstory canopy cover of approximately 30 percent consisting of limber pine and Douglas-fir trees. Two 100-foot transects were established across the drill site to quantitatively determine predisturbance conditions. The transects indicated that approximately 29 percent of the area was covered by grass, 41 percent by shrubs or sub-shrubs, 3 percent by forbs, 1 percent by moss and/or cryptogamic crust, 1 percent bare soil, 14 percent rock and 10 percent litter. Although not sampled, overstory canopy cover is approximately 30 to 70 percent. Predominant graminoid species included sheep fescue, Idaho fescue, Canada wildrye, elk sedge, and prairie junegrass. Shrub species included big sagebrush, rabbitbrush, and common juniper. Forb species included lupine, yarrow, Hood's phlox, fleabane daisy, pussytoes, and cymopterus. *None of the species of special concern listed in Table 3-4 were identified at the drill site during the field survey conducted in July, 1989. Although, the same detailed scrutiny was given ninebark bushes in the vicinity of the Gold Creek drill site with the same results described for the proposed drill site.*

3.6 WILDLIFE

3.6.1 Introduction

The affected environment of the project area includes the proposed drill sites, access roads,

and the zones of influence surrounding these project components. The evaluation of access road alternatives and variations includes both new road construction as well as existing roadways that would be utilized during the project (Exhibits 2-1, 2-2, 2-3, 3-1, and 3-2).

Seven primary wildlife habitat types are associated with the proposed drill sites and road construction. Six of these types correspond with the vegetation types described in the Vegetation Section (see Exhibits 3-3 and 3-4), and one (rock cliffs) does not involve vegetation. The seven habitat types include (1) sagebrush scrub, (2) limber pine woodland, (3) mixed conifer, (4) alpine bunchgrass and forbland, (5) riparian cottonwood and willow, (6) agricultural land, and (7) rock cliffs. Although variation in topography and soil moisture levels produce some interfingering of habitat types, habitat types 1 through 4 above are numbered in the same general order as their occurrence along the elevational gradient, with sagebrush scrub occurring at the bottom and alpine bunchgrass and forbland occurring at the top. The rock cliff habitat occurs at the upper reaches of the mixed conifer type and extends up into and through the alpine bunchgrass and forbland. The riparian cottonwood and willow type occurs along drainage courses at mid- to lower elevations.

The proposed and alternative drill sites and the access routes leading to these sites pass through habitats of several species listed in the Custer National Forest LRMP as major-interest wildlife species (USDA-FS 1987b). These habitats include elk winter and fall/rutting range, spring/calving habitat, and migration corridors; and year-round habitats of mule deer, pronghorn antelope, and white-tailed deer. The habitats of four species listed as management indicator species for the Custer National Forest (USDA-FS *1987b*) *occur on or adjacent to* the drill sites and access alternatives. These species include Brewers sparrow, northern oriole, yellow warbler, and goshawk. Habitats of several other wildlife species also occur on or adjacent to the proposed project area. These habitats include white-tailed prairie dog colonies, year-round sage grouse habitat, early fall blue grouse habitat, spring and fall black bear habitat, and nesting and foraging habitats for prairie falcons.

No federally listed threatened or endangered wildlife species, or candidate species are known to inhabit or frequent either drill site or access alternative; however, several such species are known to occur occasionally or periodically in the area (bald eagle and peregrine falcon). Federally listed species and high interest candidate species are discussed in detail in the Biological Evaluation presented in Appendix F. Hacked peregrines have been sighted in the general region and one active peregrine nest occurs within a 50-mile radius of the proposed activity (Oakleaf 1988, Flath 1988, Roop 1988). Although the proposed action is not likely to impact this species, there is a possibility that new nests will be established in this region in the future (Oakleaf 1988). Although no nesting is known to occur, bald eagles are known to hunt in the area during the winter months (Stewart 1988).

No classified grizzly bear habitat occurs on or in the near vicinity of the project area, and there are no records of grizzly bear sightings either along the eastern front of the Line Creek Plateau or on the big game winter range along the Montana/Wyoming state line (Roop 1988 and Stewart 1988). The nearest classified grizzly bear habitat consists of Management Situation II and occurs approximately 10 miles southwest of the project area on the Shoshone National Forest (Exhibit 3-5). The potential for a grizzly bear sighting exists, but the probability of occurrence is very low (Roop 1988).

There are no confirmed black-footed ferret sightings in or near the project area, and only marginal habitats for this species exist in the entire region (Stewart 1988 and Flath 1988). There are no records of ferruginous hawk sightings in the vicinity of the proposed project and occurrence of this species is unlikely (Flath 1988). According to Flath (1988), apparently suitable habitats exist for several other species for which there are no records of sightings (Swainson's hawk, mountain plover, long-billed curlew, and spotted bat). *No evidence of long-billed curlews, mountain plovers, or Swainson's hawk was found during extensive surveys conducted in June, 1989 along each of the road access alternatives and variations.* Marginal or peripheral habitats for the North American wolverine and lynx occur on both drill site alternatives, but there are no records

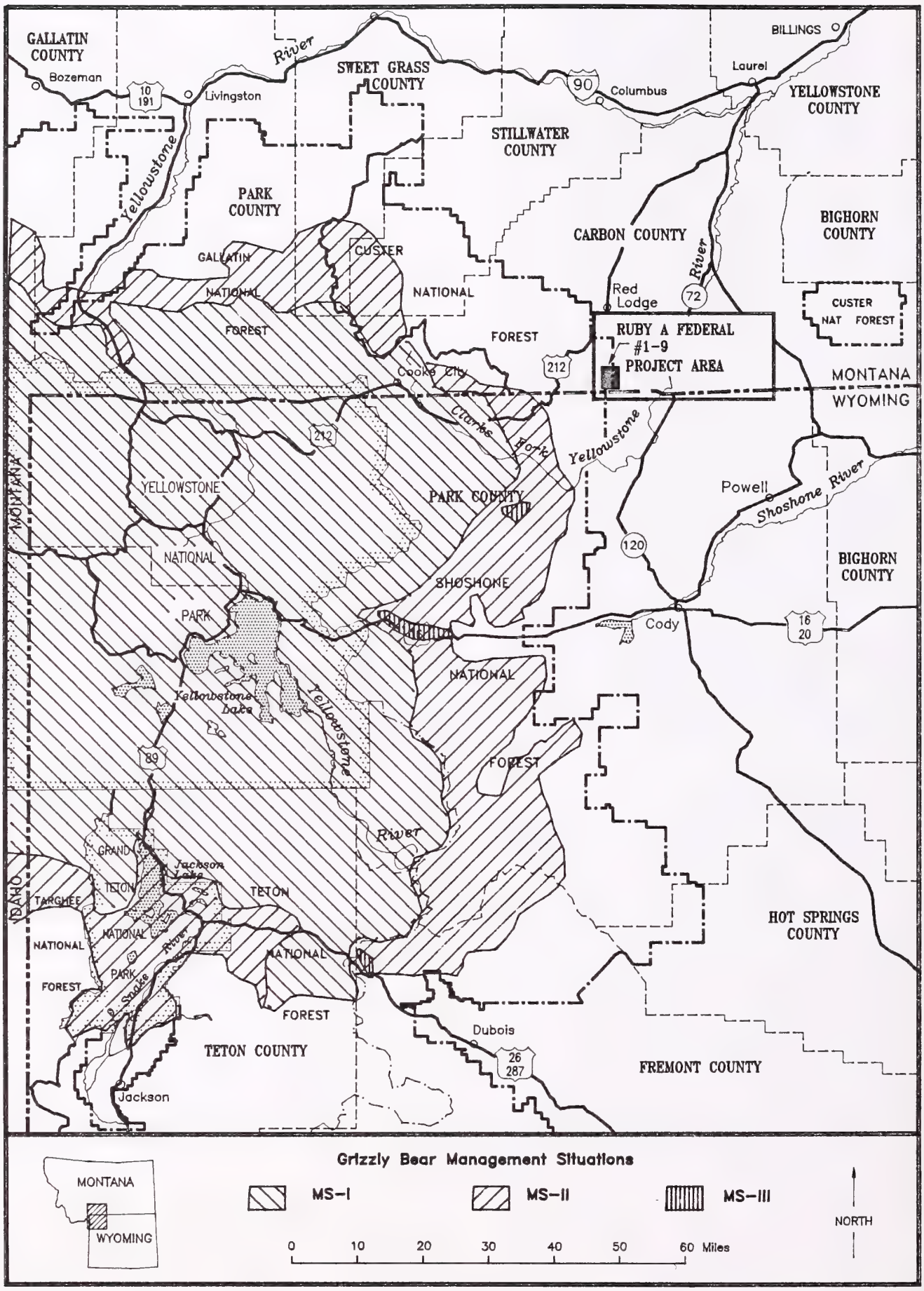

Exhibit 3-5. Grizzly Bear Habitats in the Greater Yellowstone Area.

of sightings and the probability of occurrence is very low (Flath 1988). The probability of occurrence of federally listed or candidate species is considered in more detail in the remainder of this document under the respective access and drill site alternatives.

Other typical wildlife species that occur in the area include pronghorn antelope, coyote, cottontail rabbit, red squirrel, porcupine, chipmunk, pocket gopher, golden eagle, prairie falcon, goshawk, Hungarian partridge, chukar partridge, western tanager, raven, robin, Townsend's solitaire, brown creeper, grey jay, loggerhead shrike, Clark's nutcracker, Cassin's finch, pine grosbeak, dark-eyed junco, black-capped chickadee, and white-crowned sparrow. Mountain lions are also reported to make occasional use of the area (Stewart 1988 and Van Dyke 1989). Van Dyke (1989) states that he has sighted cougar tracks along the face and ridgelines of the area, but not in the draws of either Ruby or Gold creeks. He feels that the lions are in the area to pursue mule deer, *but probably also take young elk.*

Although the potential for recreational viewing and study of wildlife on the proposed project area exists, by far the greatest single use is for recreational hunting (USDA-FS 1987b). Elk, mule deer, white-tailed deer, pronghorn antelope, black bear, blue grouse, sage grouse, and Hungarian and chukar partridge are game species that occur within the zone of influence of the proposed project. Although deer hunting provides the greatest amount of hunter recreation time on the Custer National Forest, elk are the most prized big game animal, and public interest in this species is high (USDA-FS 1987b).

Both the proposed and the alternative drill sites are located near the northern edge of the winter range for the Line Creek elk herd (Exhibit 3-6). This winter range extends across the state line into Wyoming and supports elk from both Montana and Wyoming. Approximately 400 elk winter on these borderline slopes, with roughly 120 to 140 of these animals from Montana origins and 260 to 280 moving up from Wyoming (Stewart 1988, Van Dyke 1988, and Roop 1988). According to Van Dyke (1989) and Stewart (1989) the Montana portion of this herd is growing and has increased by 135 percent since 1977.

The proposed alternative drill sites are located within fall/rutting and elk calving habitats of the Montana fraction of the elk herd (Exhibit 3-6). Because of the additional security value provided by the more dense vegetative cover on the Ruby site, Stewart (1989) and Van Dyke (1989) feel that the quality of fall/rutting and calving habitats on the proposed drill site (Ruby Creek) is somewhat superior to that of habitats occurring on the alternative drill sites (Gold Creek).

Calving activities, which are not extensive on either site, are never-the-less particularly important because of the currently low calf/cow ratio (36/100) and low productivity level in this herd (Van Dyke 1989 and Stewart 1989). Although fall range for the Montana elk extends from the top of the Line Creek Plateau down through the lower elevation toe slopes and is normally adequate and not limiting, current studies by Van Dyke (1989) indicate that it may be in short supply and become critical during extremely dry years when animals are forced to concentrate on the limited supply of moist habitats available in this area. Similarly, when extremely large amounts of snow accumulates on the Line Creek Plateau and upper face during an unseasonably early period in the fall, habitats available to elk are greatly reduced and the animals are rapidly constricted to the much more limited habitats along the lower elevation toe slopes (Stewart 1989 and Van Dyke 1989).

According to estimates based on a single year of data collected by Van Dyke (1989) during the fall of 1988 and earlier studies conducted by Stewart (1989), it appears that there are approximately 23 square miles of useable fall elk habitat during a year of normal or average climatological conditions. Both Van Dyke (1989) and Stewart (1989) emphasize that these are preliminary calculations based on best current information available and are subject to change pending the collection and analysis of new data. New data is currently being collected by Dr. Fred Van Dyke as part of an on-going study. Of these 23 square miles of normal fall habitat, only about 10 square miles are available to elk during drought years or seasons of unusually high snow accumulations early in the year (Van Dyke 1989). The 10 square miles of critical or core habitat are located on the east face of

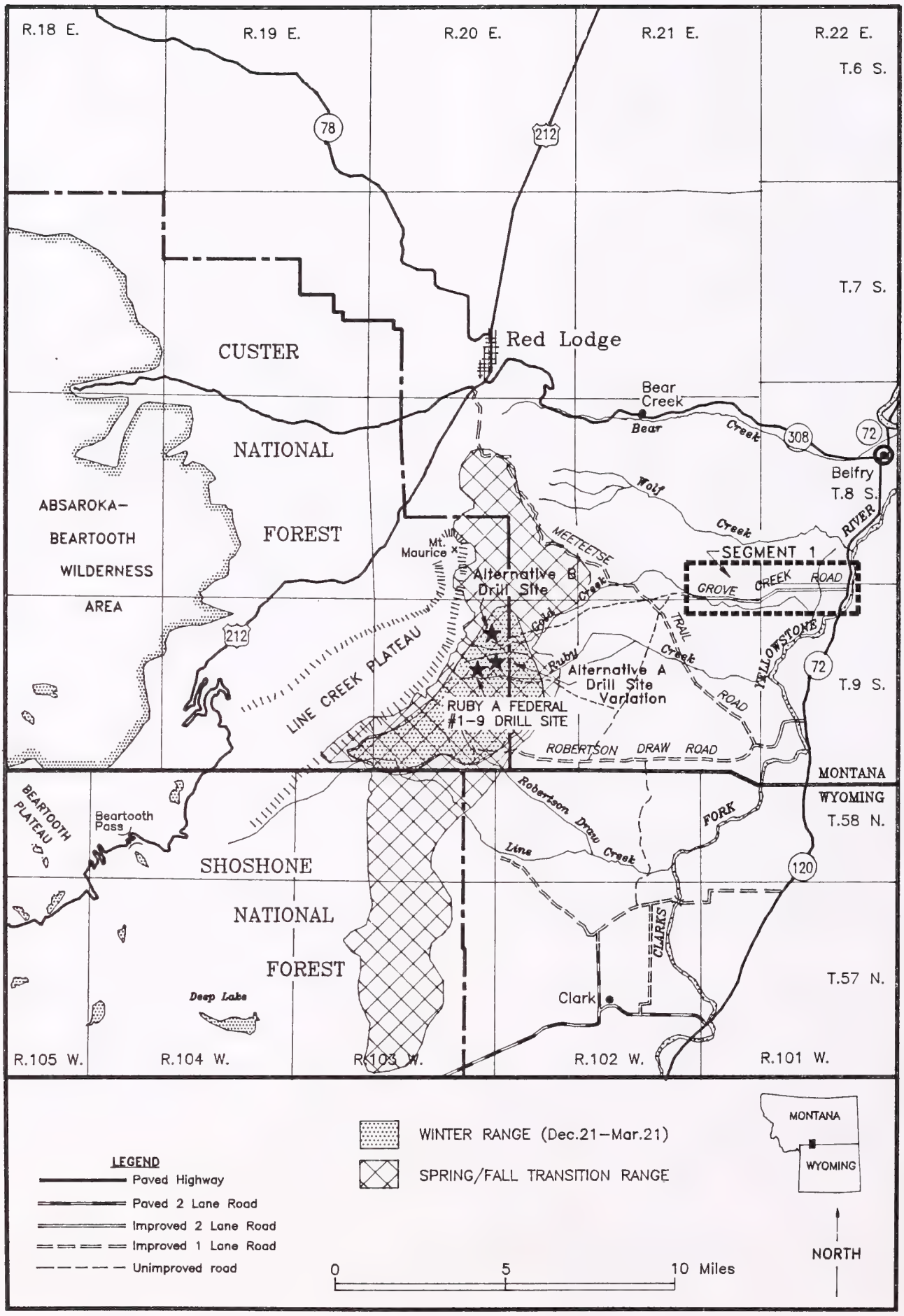

Exhibit 3-6. Sensitive Elk Habitats in the Ruby A Federal No. 1-9 Project Area and Segment 1 of the Access Routes.

the Line Creek Plateau and includes the headwaters of both Ruby and Gold creeks.

Current research by Van Dyke (1989) indicates that during late winter and early spring the elk tend to range eastward on the toe slopes out to approximately one mile from the eastern face of the Line Creek Plateau. Most use occurs at night and into the early morning at which time they retreat back into the wooded draws along the face of the plateau. Stewart (1988) concurs and reports observing similar behavior during prior years. Such use apparently occurs along the entire east face, at least during some years, between Robertson Draw Road on the south to Grove Creek on the north.

One of the stated objectives in the Management Plan for the Custer National Forest (Management Area C) is to "manage the Line Creek Elk habitat area to improve elk winter range" and, specifically, to "manage to improve the quantity and quality of forage and to provide adequate cover (thermal and hiding). . . . Other uses are allowed to the extent that they do not conflict with elk use" (USDA-FS 1987b).

3.6.2 Alternative A

3.6.2.1 Access Route

Alternative A accesses the proposed drill site via roads from the east that extend westward from State Highway 72 for approximately 13.8 miles to within 0.3 miles of the drill site (See Exhibits 2-2, 2-3, and 3-2). The access route is broken into four different segments based on the nature of the existing road, if any, and the magnitude or extent of proposed improvements and construction (Exhibits 3-6 and 3-7). The types of wildlife habitats traversed by each of these segments are described in detail by segment.

Segment 1: Existing County Road

This access segment consists of five miles of the improved county Grove Creek Road extending westward from State Highway 72 to its terminus. The first two miles of this segment of road traverses agricultural lands and the remaining three miles intersect sagebrush scrub habitat (Exhibit 3-6). This segment of road intersects no officially designated critical wildlife habitats but several important wildlife species are likely to occur in habitats adjacent to the road. Mule deer, Hungarian partridge, and chukar partridge are year-round residents of the river bottom/riparian corridor along the Clarks Fork and forage outward from this corridor for several miles into the adjacent agricultural and sagebrush habitats and can be expected to occur throughout the entire segment of the county road access (Stewart 1988). Mule deer concentrate in the agricultural fields and pastures along the eastern two-thirds of this road segment during the fall, winter, and spring seasons (Exhibit 3-8).

One sage grouse lek occurs north of the county road segment in Sec 30 T8S R22E (Exhibit 3-9). Suitable nesting and foraging habitats exist nearby, and grouse could be encountered along this segment of road during any month of the year. Suitable habitat for Swainson's hawk exists along this segment of access but no nest locations are documented (Flath 1988 and Stewart 1988). No sighting records for mountain plover or long-billed curlew exist for the vicinity of the proposed project (Flath 1988), but habitats similar to those in which these species were sighted along the Clarks Fork in Wyoming, approximately ten miles south, do occur along portions of the county road segment (Greenquist 1988 and Roop 1988). Bald eagles are known to occur along the Clarks Fork during the winter months and undoubtedly hunt the area bisected by the county road segment (Oakleaf 1988, Flath 1988 and Stewart 1988). Golden eagles may also hunt the western portion of this access segment. Only one known prairie dog town occurs along this access segment. According to Flath (undated) this colony consists of only two acres and is located at least one-half mile north of the road in Sec 33 T8S R22E (Exhibit 3-9 and Table 3-5).

Segment 2:

This access segment consists of eight miles of unimproved roadway extending between the west end of the county road and the Forest boundary (Exhibit 3-7). This entire segment of access bisects sagebrush scrub habitat, but closely parallels the riparian corridor along Ruby Creek in the upper or western-most 1.2 miles and traverses the edge between the limber pine and sagebrush scrub habitat types for about one-half mile.

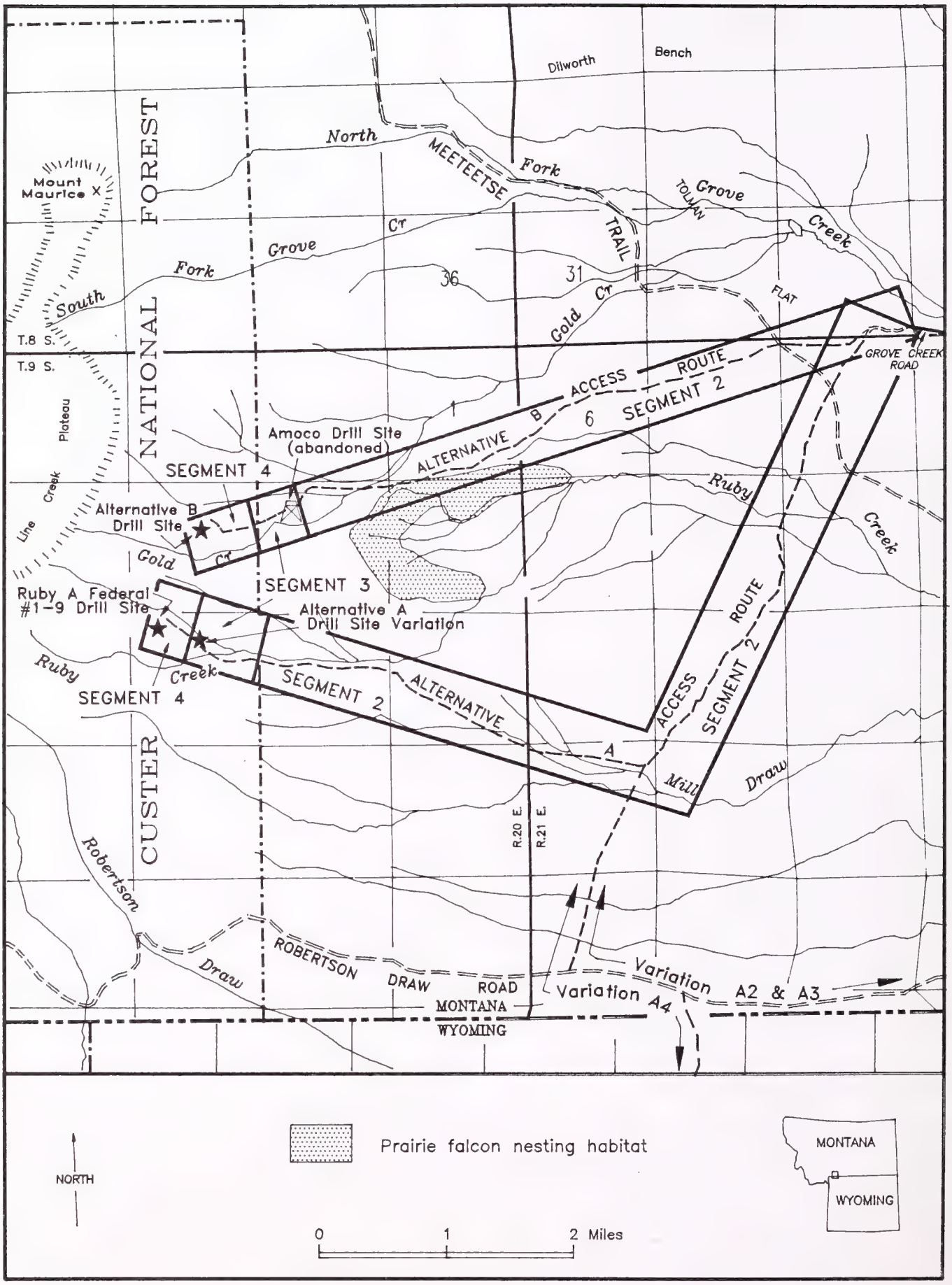

Exhibit 3-7. Prairie Falcon Nesting Habitat and Segments 2 through 4 of Access Alternatives A and B.

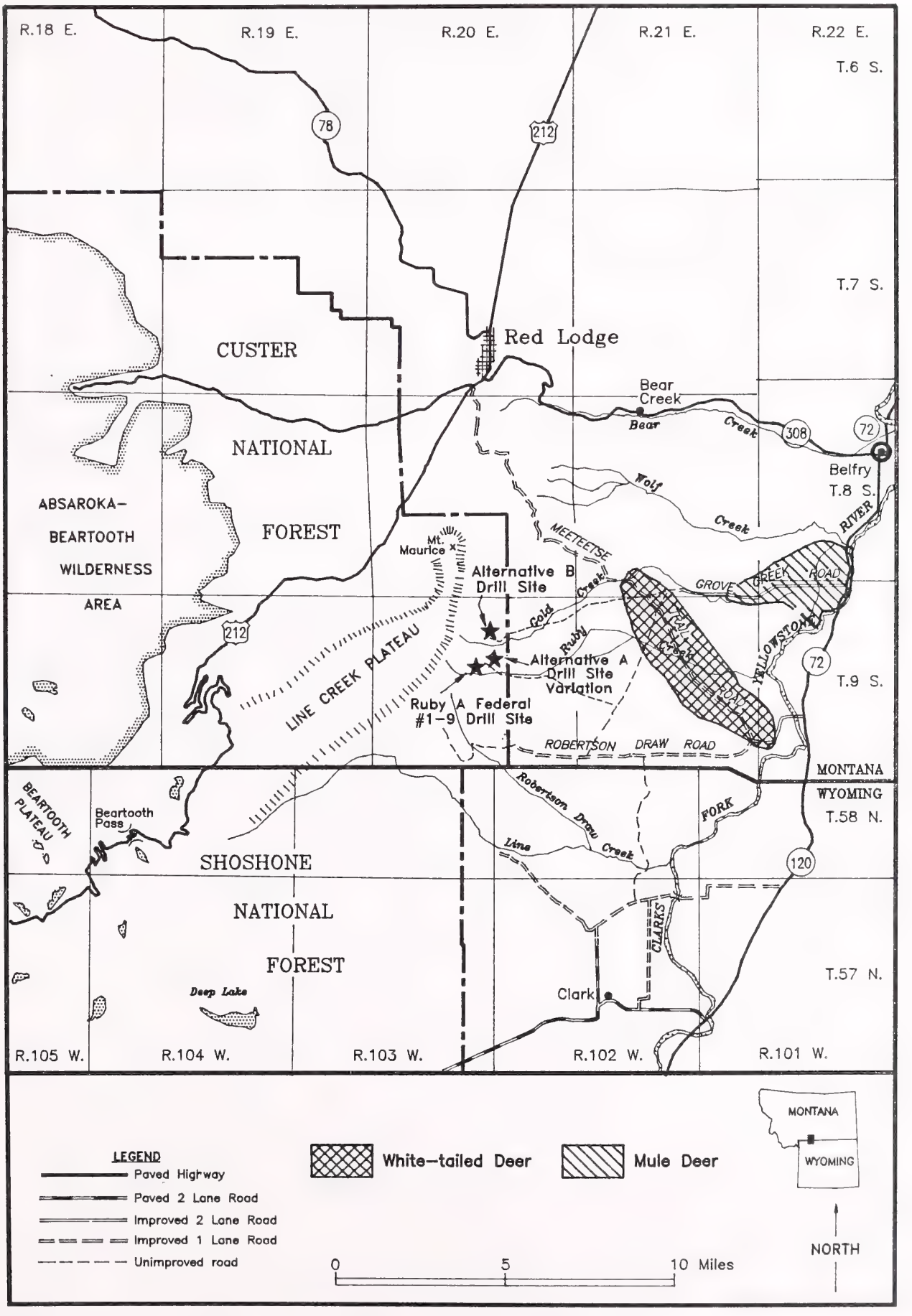

Exhibit 3-8. Concentration Areas of Mule Deer and White-Tailed Deer Along Proposed Access Alternatives.

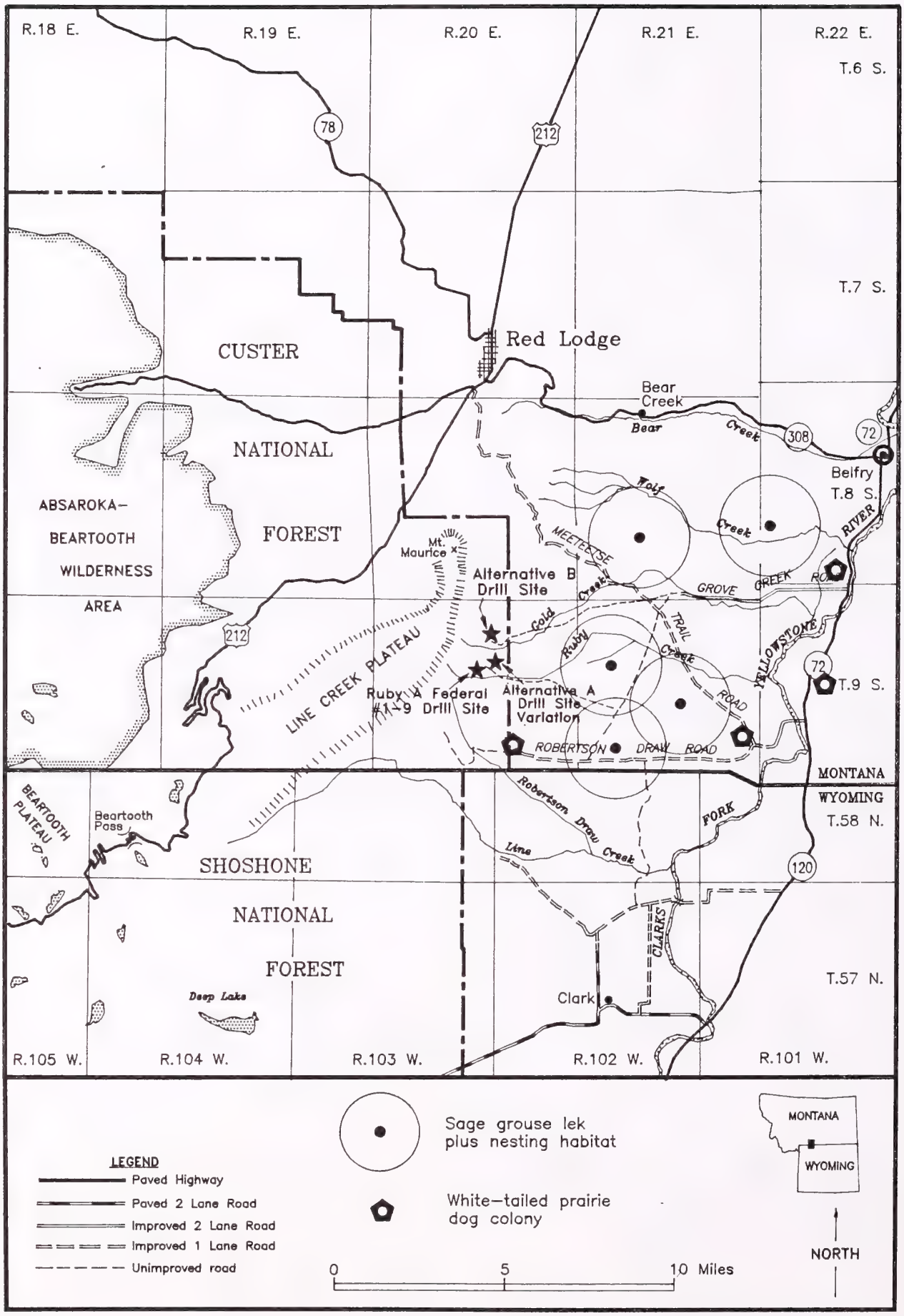

Exhibit 3-9. Locations of White-Tailed Prairie Dog Colonies and Sage Grouse Leks along Access Alternatives.

Table 3-5. **Location, Size, and Land Ownership of White-tailed Prairie Dog Colonies Near Phillips' Ruby A Federal No. 1-9 Exploratory Drill Sites and Access Alternatives.**

Colony Location	Estimated Size (acres)	Land Ownership (acres)
Sec 33 T8S R22E	2	Private - 2
Secs 16, 17, 20 T9S R22E	75-100	Private - 75-100
Sec 24 T9S R21E	19	Private - 19
Sec 26 and 27 T9S R20E	248	Private - 176 USDA-FS - 48 USDI-BLM- 24

Source: Flath undated

This segment traverses habitats of sage grouse, pronghorn antelope, prairie falcon, white-tailed jackrabbit, cottontail rabbit, and possibly Swainson's hawk as well as white-tailed deer winter range and movement corridor (Exhibit 3-8). Mule deer may be encountered occasionally. The access passes within approximately three-quarter miles of a block of limestone cliffs that offer apparently suitable nesting habitat for prairie falcons (Exhibit 3-7). Based on his field sightings of prairie falcons in and around these cliffs, Anderson (1989) feels that an aerie is probably present. The habitats along this access segment are hunted all year by golden eagles and during the winter months by bald eagles (Stewart 1988).

This roadway passes within approximately one-half mile of one sage grouse lek in the SW1/4 SW1/4 of Sec 8 T9S R21E and within 1.2 miles of a second lek in the center of Sec 29 T9S R21E (Exhibit 3-9). Since the majority of sage grouse hens using a given lek nest within a 1.5-mile radius of that lek, this segment of access will traverse approximately 3.7 miles of nesting habitat. The access does not intersect any prairie dog colonies, but passes within approximately 1.75 miles of the white-tailed prairie dog colony of about 250 acres (Flath undated) located in Secs 26 and 27 T9S R20E (Exhibit 3-9).

Segment 3:

This segment of access consists of 0.8 miles of *existing unimproved road* extending between the eastern boundary of the *Forest* and the termination of this track in the SW1/4 SW1/4 of Sec 10 T9S R20E (Exhibit 3-7). A short section (0.1 mile) of the upper or westernmost portion of this access segment bisects the limber pine habitat type. The remaining length of road (0.7 mile) bisects sagebrush scrub habitat, which is tightly interfingered in a vegetative mosaic with the limber pine, mixed conifer, and riparian habitat types.

This segment of access bisects the habitats of the same wildlife species listed under the next section (3.6.2.2 Drill Site), and the description of affected environment presented in that section applies equally to this section of roadway. In addition, this access segment both crosses and closely parallels the riparian habitat type which may provide suitable spring and summer habitats for the northern oriole and yellow warbler, which are both management indicator species for riparian tree and shrub habitats on the Custer National Forest (USDA-FS 1987b).

Segment 4:

This segment of access consists of 0.3 miles of new road construction extending between the upper end, or termination of, the two-track access in the SW1/4 SW1/4 of Sec 10 and the drill site in the NW1/4 NW1/4 of Sec 15 T9S R20E (Exhibit 3-7). This entire segment traverses the limber pine habitat type and bisects the habitats of the same wildlife species listed for the drill site. The description of affected environment presented in the following section applies equally to this segment of road.

Alternative A Road Variations:

In addition to the proposed access route, three access route variations to the proposed drill site have been identified by the BLM and FS for consideration. These routes were described in detail in the Transportation Section of this chapter and are shown on Exhibit 3-2. In general, the wildlife resources associated with these access route variations are similar. Differences between them, as well as potential impacts that could occur as a result of their implementation, are compared and summarized in the Wildlife Section of Chapter 4 (Section 4.6.3.1.1 and Table 4-3).

3.6.2.2 Drill Site

3.6.2.2.1 Proposed Drill Site

The drill site occurs in a sagebrush scrub clearing within the limber pine woodland habitat type and near the upper edge of the winter, fall/rutting, and spring/fall transition ranges of elk (Exhibit 3-10). This area is traversed during fall and late spring migration periods by elk enroute to and from winter range along the south and south-eastern toeslopes of the Line Creek Plateau near the Wyoming/Montana border (Exhibit 3-6). Approximately 400 elk winter on these borderline slopes with roughly 120 to 140 animals being from Montana origins and 260 to 280 moving up from Wyoming (Stewart 1988, Van Dyke 1988 and Roop 1988). At any one time approximately 40 to 60 individuals may be on or proximal to the drill site during the winter and spring/fall migration periods, with some elk, mostly bulls, remaining in the vicinity of the drill site all winter (Stewart 1988 and Van Dyke 1988 a and b). The heaviest concentration of elk in the area of the drill site occurs during late winter (March) through June as the animals work their way back to the high country, with some cows remaining late enough to drop calves (Van Dyke 1988 a and b). According to Van Dyke (1988b) the saddle or topographic bench on which the proposed drill site is located, lies on a route heavily traveled by elk moving between drainages.

According to Van Dyke (1989) and Stewart (1988), low *to moderate* numbers of mule deer utilize the drill site and surrounding habitats the year-round, and also move through this area during their spring/fall migrations to winter range north and east of the drill site (Exhibit 3-8). Concentrations of deer do not occur in this area during the mid-winter months (Stewart 1988). The density of black bears at the heads of drainages along the east-facing toe slopes of the Line Creek Plateau is relatively high. These habitats, which include the drill site, are utilized extensively by bears during the spring months. Bears utilize the mixed conifer habitat type upslope from the drill site during the fall when the nuts of the whitebark pines constitute an important component of the bears' diet (Stewart 1987 and 1988). During years when the whitebark pine nut crop is poor, bear use at lower elevations, including the drill site, may be high (Stewart 1989). The number of rocks and small boulders that have been moved by bears in their search for food items, such as grubs, ants, insects, rodents, etc., provides evidence of black bear use on and around the drill site.

Nesting and brood-rearing habitats of blue grouse occur on and around the drill site. This species leaves the drill site area during the fall and migrates to winter range at higher elevations (Stewart 1988). Golden eagles occur in the area and are commonly seen riding the updrafts along the cliff faces above the drill site to the west and north. No golden eagle nests are known to occur in the area (Stewart 1988 and Flath 1988), but there is suitable nesting habitat in the cliffs several miles to the north and south of the drill site, and a nest probably exists there (Anderson 1989). Bald eagles do not nest in this area (Oakleaf 1988, Stewart 1988 and Flath 1988) but do concentrate along major waterways, such as the Clarks Fork, during the winter months and radiate outward from these corridors to hunt. The drill site is probably not frequently used by bald eagles due to the site's excessive distance from the river and

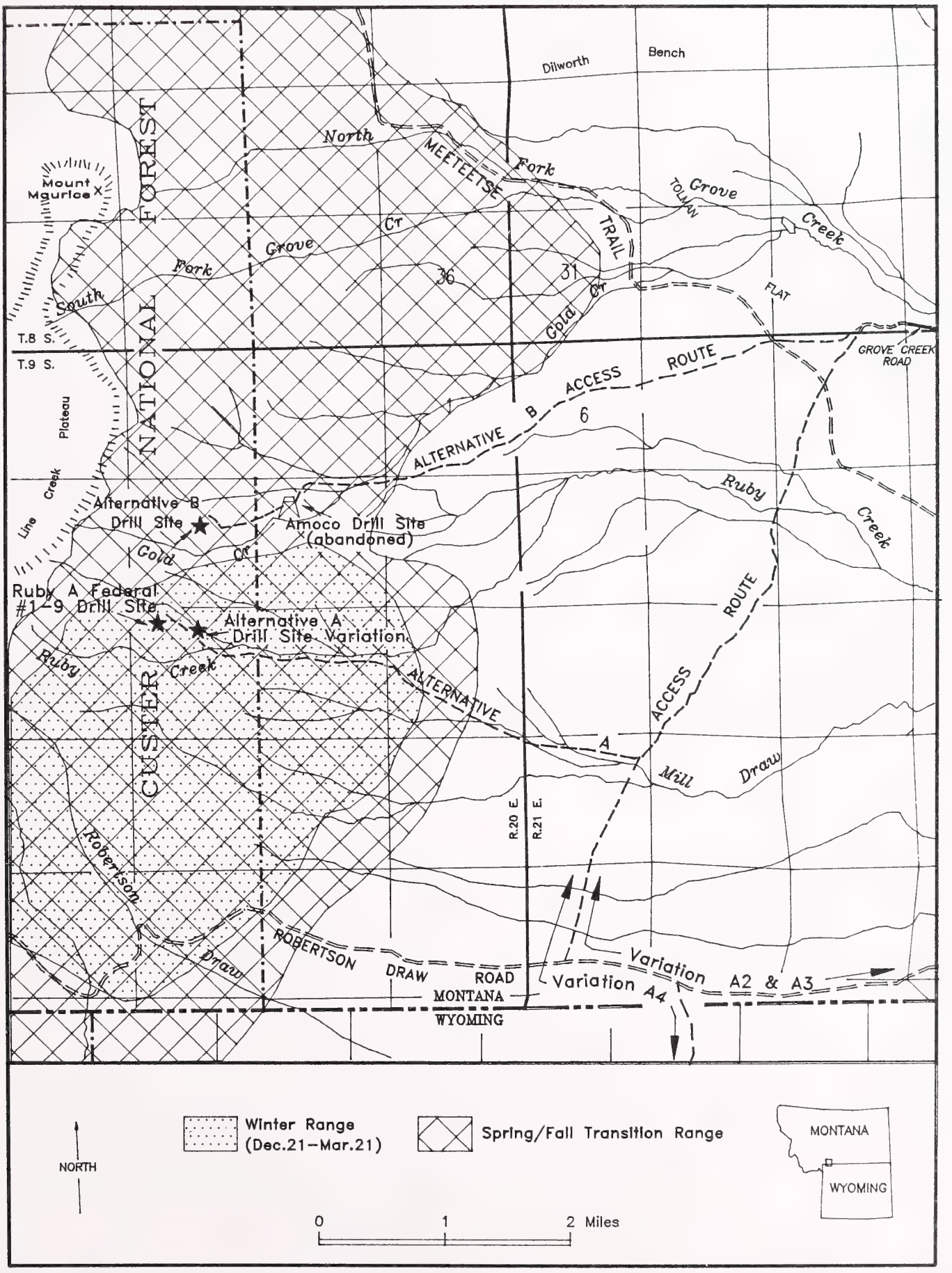

Exhibit 3-10. Elk Winter and Spring/Fall Transition Ranges in Relation to Drill Site and Access Route Alternatives.

lack of a substantial winter prey base for raptors. This species is, however, known to make at least occasional use of the area and has been observed soaring along the cliffs adjacent to the drill site during the winter (Stewart 1988).

The sagebrush stands on and adjacent to the drill site constitute suitable spring and summer habitats for Brewer's sparrow, a management indicator species for sagebrush habitats on the Custer National Forest (USDA-FS 1987b). Although this species was not observed during the site inspection on October 4, 1988, it likely breeds and nests there. Known distribution records and habitat requirements of the spotted bat, a Category 2 Candidate species, indicate that this species might occur in the vicinity of the proposed project (Taylor 1988 and Snow 1974), but no specimens have been collected and no observations have been made. Goshawks are known to occur in the general vicinity of the drill site but there are no documented nest locations (Stewart 1988).

Both the North American lynx and the wolverine are known to occur in the greater region surrounding the project area (Reeve, Lindzey and Buskirk 1986). Habitats in the project area, however, are less than ideal, and there are no sighting records of either species in the vicinity of the proposed project (Flath 1988).

3.6.2.2.2 Alternative A Drill Site Variation

Except for the elimination of Road Segment 4 *(0.3 miles of new road construction) and 0.4 miles of existing unimproved road from the upper end of Road Segment 3, access to the drill site variation is identical to that described for the proposed drill site.*

The drill site variation occurs on the gently-sloping bottomlands of Ruby Creek. The site is dominated by sagebrush scrub habitat which is interwoven with fingers of limber pine, mixed conifer, and riparian habitat types. The variation drill site exhibits habitats of the same wildlife species as described for the proposed drill site and, with one exception, the description of the affected environment for the variation drill site is identical to that presented in Section 3.6.2.2.1 for the proposed drill site. The exception consists of the fact that the proposed drill site occurs on a saddle or topographic bench which lies on a route heavily traveled by elk moving between drainages, while the variation drill site does not (Van Dyke 1988b). Elk use and move through the variation drill site area, but not to the extent that they use the proposed drill site area.

3.6.3 Alternative B

3.6.3.1 Access Route

Alternative B accesses the proposed drill site via roads from the east which extend westward from State Highway 72 for approximately 10.3 miles to within 0.9 miles of the drill site (Exhibits 2-1, 2-2, and 2-3). The access route is broken into four different segments based on the nature of the existing road, if any, and the magnitude or extent of proposed improvements and construction (Exhibits 3-6 and 3-7). The types of wildlife habitats traversed by each of these segments are described in detail by segment.

Segment 1: Existing County Road

This is the same segment of road previously described for the Alternative A access route in the section entitled Existing County Road. The description of affected environment for Segment 1 of the Alternative B access is identical to that presented for Alternative A.

Segment 2:

This access segment consists of 5.3 miles of unimproved dirt two-track road extending between the west end of the Grove Creek Road and the abandoned Amoco drill site in Sec 11 T9S R20E. (Exhibit 3-7). The eastern 4.2 miles of this segment of access bisects sagebrush scrub habitat while the western 1.1 miles traverses limber pine habitat and crosses the riparian habitat of Gold Creek in one area. The 4.2 mile segment of roadway that traverses sagebrush scrub bisects habitats of sage grouse, pronghorn antelope, white-tailed deer movement corridor (Exhibit 3-8), prairie falcons, white-tailed jackrabbit, cottontail rabbit, and possibly Swainson's hawk. Mule deer may be encountered occasionally. The sagebrush scrub portion passes adjacent to a block of limestone cliffs that apparently offer suitable nesting habitat for prairie falcons (Exhibit 3-7). Based on his field sightings of prairie falcons in and around these cliffs, Anderson (1989) feels that an

aerie is probably present. The sagebrush scrub segment of roadway passes within approximately 1.8 mile of the sage grouse lek in the SW1/4 SW1/4 of Sec 8 T9S R21E but does not traverse designated nesting habitat (Exhibit 3-9). Because of the proximity of the lek and suitable nesting and foraging habitats, however, sage grouse could be encountered along this segment of road during any month of the year.

The 1.1-mile segment that traverses limber pine habitat bisects habitats of the same wildlife species listed under Alternative B - Drill Site, and the description of affected environment presented in that section applies equally to this section of roadway. In addition, this 1.1-mile segment both crosses and closely parallels the riparian habitat type that may provide suitable spring and summer habitats for the northern oriole and yellow warbler, both of which are management indicator species for riparian tree and shrub habitats on the Custer National Forest (USDA-FS 1987b).

The habitats along all of the Segment 2 access are hunted year-round by golden eagles and during the winter months by bald eagles (Stewart 1988). None of the Segment 2 access intersects any prairie dog colonies and, according to Flath (undated), the nearest approach to a colony is approximately three miles (Exhibit 3-9).

Segment 3:

This segment of access consists of 0.4 miles of unimproved two-track road extending between the abandoned Amoco drill site in Sec 11 T9S R20E and the Forest boundary (Exhibit 3-7). This entire 0.4-mile segment traverses limber pine habitat and bisects habitats of the same wildlife species listed under Alternative B - Drill Site. The description of affected environment presented in that section applies equally to this section of roadway. In addition, this 0.4-mile segment both crosses and closely parallels the riparian habitat type that may provide suitable spring and summer habitats for the northern oriole and yellow warbler, management indicator species for riparian tree and shrub habitats on the Custer National Forest (USDA-FS 1987b).

Segment 4:

This segment of access consists of 0.5 miles of unimproved trail and unroaded topography extending between the Forest boundary and the Gold Creek Drill Site in the SW1/4 NE1/4 of Sec 10 T9S R20E (Exhibit 3-7). This entire 0.5-mile segment traverses limber pine habitat and bisects habitats of the same wildlife species listed under Alternative B - Drill Site. The description of affected environment presented in that section applies equally to this section of roadway. In addition, this 0.5-mile segment closely parallels the riparian habitat type which may provide suitable spring and summer habitats for the northern oriole and yellow warbler, management indicator species for riparian tree and shrub habitats on the Custer National Forest (USDA-FS *1987b*).

3.6.3.2 Drill Site

The drill site exhibits habitats of the same wildlife species as the Alternative A drill site, and, with a few exceptions, the description of the affected environment for the Alternative B drill site is identical to that presented in the section entitled Alternative A - Drill Site. One of the exceptions involves the intensity and timing of elk use of the area.

Although the nature of elk use of the two drill site alternatives is similar, elk tend to leave the Gold Creek site earlier in the fall and return to it later in the late winter/early spring than they do the Ruby Creek site (Stewart 1988 and Van Dyke 1988b). Past observations by Stewart (1988) have indicated that the Ruby Creek site has been the northern extreme of the main winter range for elk, while the Gold Creek site lies just outside of this range (Exhibit 3-10). He observed that cows and calves utilize the winter range as far north as Ruby Creek and that mainly bulls utilize the area north of Ruby Creek up to the Gold Creek drill site. *Analyses of locations of radioed elk conducted by Van Dyke (1989) in his current study show that some elk use the Gold Creek area during November and December.*

The Gold Creek drill site also differs from the Ruby Creek drill site in the fact that mule

deer do not occur year-round, but use the area only during the early and late winter, and during spring/fall migrations (Van Dyke 1989 and Stewart 1989).

3.7 VISUAL RESOURCES

3.7.1 Introduction

The project area is typical of the Middle Rocky Mountain Physiographic Province. The topography is steeply sloping, forming distinct microclimates with a resultant variability in vegetation cover types. The interspersed mosaic of vegetation communities results in a visually interesting and appealing landscape that would be classified as Common-Natural in character (See Glossary for definitions of terms). The highest elevations occur along the western ridgeline that delimits the Line Creek Plateau. The ridgeline and east-facing slope are a continuous and dominant landscape element. The palisades just north of the proposed site, Meeteetse Spires, are regionally unique topographic landmarks. Due to their unique character and associated physical and biological attributes, the Meeteetse Spires have recently been proposed as a nature preserve as discussed previously (Lesica 1988).

Six distinct vegetation cover types were identified in the immediate project area and described in the Vegetation Section. These communities include sagebrush scrub, limber pine woodland, mixed conifer, alpine bunchgrass and forblands, riparian cottonwood and willow, and agricultural land. The mixed conifer stands dominate the upper elevations of north and east-facing slopes. In most locations there are distinct edges between conifer stands and lower growing forms of vegetation on south-facing slopes. Some open stands of limber pine, however, create visual transitions between pure conifer stands and the sagebrush scrub. Riparian vegetation associated with Gold Creek and Ruby Creek creates visually important lineal patterns in the landscape (See Exhibits 3-3 and 3-4). The visual importance of these patterns is emphasized in the fall when the leaves turn color. Soil colors in the project area vary depending on location; however, a light brown to gray-buff soil color is most prevalent. Lighter colored soils are most prevalent on ridges and dark soils more typically associated with riparian areas.

Major access routes in the project area include Montana Highway 72, Grove Creek Road, Meeteetse Trail, and Robertson Draw Road as shown on Exhibits 1-2, 2-2, 2-3, 3-1, and 3-2. Face-of-the-Mountain Trail as shown on Exhibit 3-11 passes close to both drill sites where observers would be in a superior (elevationally above) position. All other routes would place the viewer in a viewer-inferior position. Much of the dispersed area recreation (primarily hunting, but also including hiking and horseback riding along the Face-of-the-Mountain Trail) occurs on sideslopes and ridges that are at the same elevation as or overlook the drill sites.

The Custer National Forest LRMP has placed the immediate project area within Management Area C Visual Quality Objectives (VQO) for Management Area C "... will include Retention, Partial Retention and Modification" (USDA-FS *1987b*). The plan does not make site-specific delineations of VQO zones; however, the Shoshone National Forest has delineated site-specific VQOs in the Shoshone National Forest Land and Resource Management Plan (USDA-FS 1986d) on lands similar in character just three miles to the south. The Shoshone National Forest 2A Management Area applied to sites similar in landscape character to the project area have been assigned a VQO of Partial Retention where "management activities are not evident or remain visually subordinate to the characteristic landscape" (USDA-FS 1986c). A Partial Retention VQO was deemed appropriate for the entire Management Area C (the affected environment), including the drill site, and was used in preparing this analysis.

3.7.2 Alternative A - Proposed Action

3.7.2.1 Access Route

The Visual Absorption Capability (VAC), the ability of the landscape to absorb visual change, of the existing unimproved two-track roads along this access route is minimal; however, because of the low angle of slope, varied road alignment and diverse topography, the existing access route is not highly visible.

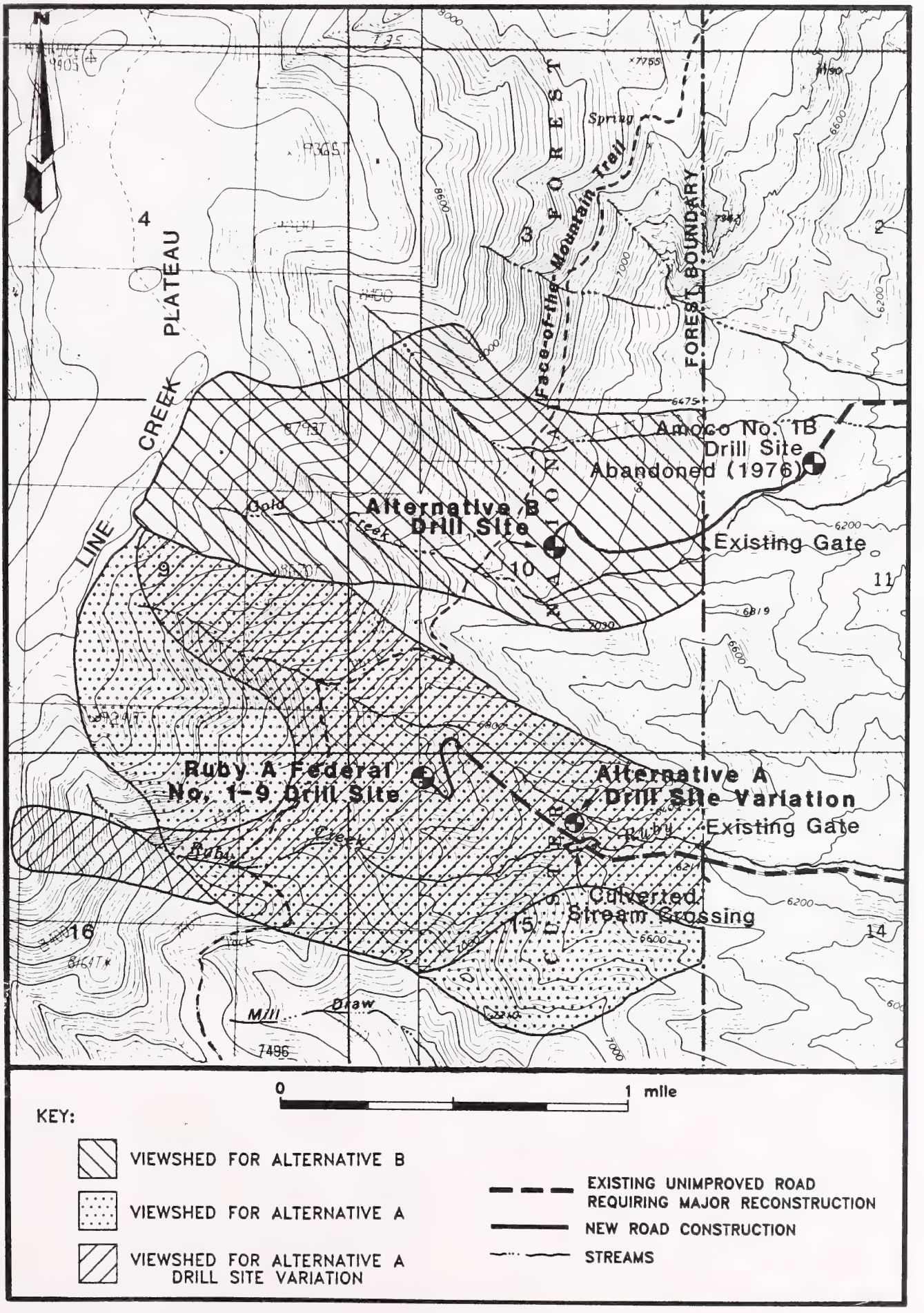

Exhibit 3-11. Areas of Visual Access to the Proposed Ruby A Federal No. 1-9 and Gold Creek Alternative Drill Sites and Access Roads on Forest System Lands.

The access route from the Forest boundary to the drill site traverses a sagebrush scrub and limber pine woodland punctuated with a narrow band of riparian vegetation along Ruby Creek at the lower elevations. Approximately 800 feet of new access road would cross a steep sideslope with a gradient ranging from 50 to 60 percent. The sideslope is oriented to the northeast, toward the primary viewer location. The slope is primarily covered by a relatively dense stand of limber pine and some Douglas-fir, with two sections each approximately 100 feet in length without tree screening. Tree height ranges between 20 to 25 feet with an average trunk spacing of 10 to 15 feet. The final 300-foot section to the drill pad crosses a flat bench vegetated with sagebrush scrub. Gray-green is the dominant color of vegetation, with dark green accents. Yellow fall color of riparian vegetation is evident at lower elevations. The VAC of this last section of road is moderate, with a few areas rated high, in some isolated locations with occasional breaks as noted above.

Three access route variations to the proposed drill site, in addition to the proposed access route, have been identified by the BLM and FS for consideration. These routes were described in detail in the Transportation section of this chapter and are shown on Exhibit 3-2. The environment of these variations is very similar to the description presented earlier for the proposed access route (Variation A1). More people see the environment of access Variations A2, A3, and A4 than Variation A1 since the roads utilized for these variations are public and receive greater volumes of recreational traffic.

3.7.2.2 Drill Site

3.7.2.2.1 Proposed Drill Site

The drill site occurs on a small bench enclosed on the north, south and west by steep topography. Predominant vegetation is sagebrush, grasses and common juniper, with scattered individual limber pine and Douglas fir. There are dense stands of mixed conifers both upslope and downslope from the site. The average height of these conifers is between 20 and 30 feet; average spacing between trunks within the stand is 10 to 15 feet. Landscape color is evenly split between gray-green and dark green. Soil color varies from light to dark brown. The VAC is moderate, with a few areas rated high for the following reasons: gently sloping pad area, mottled pattern of evergreen vegetation, enclosing topography, high trunk density, downslope evergreen screening and long distance from primary viewing areas.

The immediate viewshed, or the area surrounding the drill site that has visual access to the site, is approximately 970 acres in size as shown on Exhibit 3-11 but continues for ten miles to the east and would be visible from Highway 72, Grove Creek Road, Robertson Draw Road, and the Meeteetse Trail, as well as from some local ranches. The Face-of-the-Mountain Trail passes within approximately 600 feet west and slightly above the site and those using the trail would be able to see the drill pad (Exhibit 3-11). Those who could view the site would include a small number of hikers, trail riders, hunters, ranchers and, potentially, motorists on Highway 72. The site would be within a Partial Retention VQO.

3.7.2.2.2 Alternative A Drill Site Variation

The drill site occurs on an alluvial bench between two forks of the Ruby Creek and is located in a mosaic of sagebrush scrub, limber pine woodland, and cottonwood and willow riparian vegetation community types. Predominant vegetation is sagebrush, grasses, forbs, cottonwood and willow. Landscape color is grey-green and brown. Soil color varies from light to dark brown. The VAC is low due to the low ability of the sagebrush scrub vegetation type to absorb visual change. The site is located approximately 0.75 miles east of the Face-of-the-Mountain Trial and 500 feet below the saddle of the proposed drill site. In general, the variation drill site would be less visibly accessible, particularly from the east, than the proposed drill site.

3.7.3 Alternative B - Gold Creek Site

3.7.3.1 Access Route

Access to this drill site from the improved county road to the abandoned Amoco drill site is similar to that described for Alternative A. From the abandoned Amoco drill site, the access route proceeds upslope at a grade that varies in a range from 15 to 25 percent. The first roughly 0.3 miles of road would follow an existing unimproved jeep trail. The trail closely parallels the riparian vegetation along

Gold Creek. The riparian vegetation produces a highly visible line of contrasting color, particularly in the fall, that lead the eye of those viewing the mountain from lower elevations to the drill site area. The final section of road would depart the existing jeep trail and traverse the undulating land surface to the drill site. This section of the route would traverse sagebrush scrub with occasional scattered limber pine and Douglas fir. These conifers are 10 to 15 feet in height on average. Large boulders dispersed in random fashion add a coarse texture to the landscape. Gray-green is the dominant color of vegetation, with dark green accents and a line of yellow fall color in the riparian area. Soil color is gray-brown. The slope the road ascends is pitched toward the primary viewer position. The VAC for the lower 0.5 miles of access route is moderate to high and moderate for the remaining 0.4 miles.

3.7.3.2 Drill Site

This drill site is located on a flat to undulating east facing slope with an approximate gradient of 20 percent. It is enclosed on the north, south, and west by steeply sloping topography. An open stand of limber pine, varying in height from 10 to 20 feet with an understory of sagebrush and grass comprise the dominant vegetation types. Average spacing between conifer trunks is 20 to 30 feet. Numerous large boulders cover the site and adjacent slopes. Gray-green is the dominant landscape color with dark green accents. The soil color is a light brown. The VAC for this site is moderate for similar reasons as listed under Alternative A. Lower trunk density, shorter trees, lack of downslope screening, and a steep slope toward primary viewer positions combine to reduce the VAC rating here. The immediate viewshed is approximately 600 acres as shown on Exhibit 3-11, but would continue for ten miles to the east. The drill site, located within a Partial Retention VQO, would be visible from the same transportation routes, including the Face-of-the-Mountain Trail, as described under Alternative A.

3.8 RECREATION

3.8.1 Introduction

The Beartooth Ranger District receives the highest level of recreation use of any Ranger District on the Custer National Forest (USDA-FS 1987a). Available estimates indicate that approximately 550,000 Recreation Visitor Days (RVDs) of recreation use occurs in the Beartooth Unit each year (USDA-FS 1985); one RVD represents 12 visitor hours whether that is comprised of one person recreating for 12 hours or 12 people recreating for one hour each. This represents over 68 percent of the total recreation use estimated for the entire Custer National Forest in 1983 (USDA-FS 1987b). The Beartooth Mountains provide highly diverse recreation opportunities, including developed camping and picnicking, pristine wilderness areas, stream and lake fishing, hunting, hiking, mountain bike riding, horseback riding, nature observation and photography, skiing, and other activities in both developed and dispersed recreation settings. The accessibility of Yellowstone National Park to the southwest and the proximity of Billings, Montana, the state's largest population center, also contribute to the high level of recreation use that occurs in this general area.

Much of the recreation use in the Beartooth Unit is concentrated along the Beartooth Highway (Route 212), which provides highway access to Yellowstone National Park from Red Lodge (see Exhibit 1-2). The FS maintains seven developed campgrounds in the Rock Creek Valley adjacent to the highway which attract considerable recreation use during the summer months. In addition, dispersed recreation use is concentrated in the area to the west of the highway where there are several trails providing access into the Absaroka-Beartooth Wilderness (USDI-BLM 1986). Substantially lower levels of use occur on the Line Creek Plateau, a large roadless area lying to the east of the highway that attracts low to moderate levels of hunting, hiking, backpacking, and other dispersed recreation activities. This high elevation plateau was included as an area designated for further study in the Montana Wilderness Bill that was vetoed by President Reagan in November 1988.

Most of the recreation use in this unit of the Forest involves residents of surrounding counties in Montana. FS estimates indicate that approximately 75 percent of users come from a local three-county area of Stillwater, Yellowstone and Carbon counties. Survey data collected by members of the recreation assessment team from 61 recreationists using

areas along the Beartooth Highway during the July 4th weekend (1988) indicated that nearly 80 percent of campground users, 60 percent of backcountry hikers, and 41 percent of motorists stopping at highway overlooks were from the Billings area; an additional one-third of backcountry users were from the Red Lodge area.

3.8.1.1 Analysis Area

The analysis area used to evaluate potential recreation impacts for both the proposed and alternative drill sites incorporates surrounding Forest lands that exhibit similar topographic and recreation use characteristics. The western boundary of the analysis area used for the current project is the extreme eastern edge of the Line Creek Plateau, approximately 1.0 mile to the west of the drill site locations. The eastern boundary is the National Forest Boundary, although the analysis also considers potential impacts in an area to the east of this boundary where privately-owned lands and public land administered by the BLM are interspersed (USDI-BLM 1983). The southern boundary of the analysis area is the ridgeline on the south side of Robertson Draw, approximately 2.5 miles south of the proposed drill site. The northern boundary of the analysis area is the ridgeline on the south side of the South Fork of Grove Creek, approximately 3.0 miles north of the proposed drill site. This analysis area therefore comprises an area of approximately 4,920 acres lying between the Line Creek plateau rim on the west, the Forest boundary on the east, and major drainages to the north and south.

The FS has developed the Recreation Opportunity Spectrum (ROS) classification system for identifying the recreation potential of Forest lands and to guide recreation management. Both the proposed drill site/access route and the alternative site near Gold Creek lie entirely within an area designated as providing Semi-Primitive Motorized recreation opportunities, which characteristically provide low-to-moderate frequency of contact with others and moderate levels of human alteration of the natural setting (USDA-FS 1987b). Neither the current ROS designation or the management guidelines set forth in the Custer National Forest LRMP prohibit the use of motorized vehicles or equipment in this area. However, for the past several years all Forest roads and other lands in this area, with the exception of Robertson Draw Road, have been closed to unauthorized motorized use on a year-round basis. Consequently, the recreation opportunities presently available near the proposed and alternative drill locations do not include use of off-road vehicles, snowmobiles, or other motorized recreation activities.

In general, recreation use of this analysis area is quite low and well below the capacity of the area to provide dispersed recreation opportunities. Although estimates used for planning purposes by the Custer National Forest report 0.49 RVDs per acre per year for this area (Logan 1988), that estimate reflects District-wide average use and was not adequately adjusted to represent the substantially lower use in this area. Unlike the highly accessible areas adjoining the Beartooth Highway, this section of the Forest is less accessible. The nearby Grove Creek Limestone Palisades are very scenic and provide an attractant to motorized recreationists using the Meeteetse Trail road. The project area does not provide opportunities for developed camping and picnicking, stream and lake fishing, or other features that attract heavy use in other sections of the Beartooth Unit. There is opportunity for dispersed recreation along the Meeteetse Trail road and along the Face-of-the-Mountain Trail; however, very little overnight use is made of this area outside of the hunting seasons. Field observations by the study team during the otherwise busy July 4 holiday weekend indicated that this area was attracting very little recreation use. Individuals and groups using the area are more likely to be local residents rather than visitors from Billings or other non-local areas.

3.8.2 Alternative A - Proposed Action

The proposed drill site *and variation drill site are* located approximately 0.75 *and 0.4* miles west of the Forest boundary, *respectively*. The eastern rim of the Line Creek Plateau lies approximately one mile to the west of and 2,000 feet higher than the proposed drill site *and 1.4 miles to the west of and 2,500 feet higher than the variation drill site*. The nearest boundary of the Absaroka-Beartooth Wilderness lies approximately 7.5 *and 7.9* miles to the west of the *proposed* drill site *and variation drill site, respectively*; the Beartooth Highway comprises a major highway corridor separating the *Absaroka-*

Beartooth Wilderness area from the Line Creek Plateau and the project analysis area.

The proposed *and variation* drill sites and access routes are in a section of the Forest that receives relatively little recreation use during most periods of the year. The existing unimproved road that would be used to approach the drill sites provides potential access for recreation use of the area; however, the road is fairly rough in some sections. Moreover, much of the road segment lying east of the Forest boundary crosses private land and is not open to public use. The nearest public road access to the Forest is at Robertson Draw, over two miles to the south, or at the North Fork of Grove Creek, over three miles to the north. Consequently, recreation use of the area is limited to persons who use foot and horse trails and those who are able to obtain permission to travel the road or who illegally trespass. Nevertheless, this road does provide access for some users, including the owners of a seasonal cabin located immediately adjacent to the road on private land just east of the Forest boundary.

With the exception of this privately-owned residence there are no developed recreation sites or facilities in the area surrounding either the drill sites or access route. The Face-of-the-Mountain Trail, which traverses the Beartooth Face from north to south, lies several hundred yards upslope from (west of) the drill sites. This trail represents the eastern boundary of the RARE-II study area comprising the Line Creek Plateau. The trail generally receives light use by hikers, horseback riders, and perhaps some mountain bike riders during the summer months and is also used by hunters during the fall.

Most recreation use of the area surrounding the drill sites and access routes occurs in the fall during the various hunting seasons. Relatively modest hunting use occurs on Forest lands and on BLM and private lands to the east during upland game seasons, as well as during deer and antelope seasons. A very small number of permits for mountain goats and bighorn sheep are also issued for the general area including the drill sites, although the areas hunted tend to be in substantially higher terrain several miles to the west and southwest.

The area is an especially popular location for elk hunters during both the archery and rifle seasons. The archery season for elk, which ran from September 3 through October 16 in 1988, is an either-sex hunt that is not restricted by a quota on the number of licenses available. In addition to use by unguided hunters, several local residents indicated that the area attracts limited outfitter use (Fears 1988 and Henke 1988). At present, one outfitter who operates primarily during the elk archery season has been permitted by the FS to hunt in this general area. This outfitter maintains a base camp near Corral Creek approximately four miles northwest of the drill sites, and also maintains a holding corral on the east side of the road in Seely Creek in the Rock Creek drainage. That outfitter has indicated some use of spike camps to keep hunters in the Ruby Creek area off Forest lands for several days at a time, and stated that in an average year approximately one-half of his clients will hunt in the vicinity of Ruby Draw at some time during the season (Harrington 1988). FS records indicate that this outfitter is not permitted to establish spike camps in the project area on Forest lands. His client totals are relatively low, involving a reported 48 service days (4 clients) in 1987 and 88 service days (11 clients) in 1988 (Jaquith 1989).

Rifle season elk hunting is restricted by quotas on the number of licenses issued; in 1988 a total of 150 bull permits and 55 antler-less elk permits were available during seasons running between October 23 and November 27 for hunting Districts 520-04, 520-05, and 520-06, which include the analysis area as well as a substantially larger area (MDFWP 1988). One area resident reports that he guides an average of two or three hunters in this general hunting district during the rifle season (Chatlin 1988). However, FS records indicate that no commercial hunting guides have been permitted to operate on Forest lands in this area other than the one archery season outfitter noted previously. Consequently, elk hunters using this area during the rifle seasons are generally unguided.

Winter recreation use of the area is quite low. Forest regulations prohibiting unauthorized motorized vehicles preclude the use of snowmobiles, although some limited

snowmobile use may occur on BLM and private lands to the east. Cross-country skiing use is also reportedly quite low. Some limited winter hunting activity occurs in the general vicinity during the mountain lion season (Harrington 1988). Spring recreation use is also quite limited although spring bear hunting activity does occur in the area (Jaquith 1988 and Henke 1988). Summer recreation use is generally low, involving limited amounts of hiking, horseback riding, dispersed camping, nature observation and photography, mountain biking, and other dispersed recreation activities. Much of this use occurring near to the drill site and access route involves the Face-of-the-Mountain Trail, which is used by some organized trail ride groups as well as individuals and private parties. The small creeks in the vicinity of the drill site and access route do not provide fishing opportunities.

In addition to the proposed access route, three access route variations to the proposed drill site have been identified by the BLM and FS for consideration. These routes were described in detail in the Transportation Section of this chapter and are shown on Exhibit 3-2. Roads that would be utilized under Variations A2, A3, and A4, including the Meeteetse Trail and the Robertson Draw Road, provide recreationists with public access to the Forest.

3.8.3 Alternative B - Gold Creek Site

The recreation resources available in the area surrounding the alternative drill site and access route are very similar to those described for the proposed drill site. The drill site is only about 0.5 miles west of the Forest boundary, 1.0 miles east of the rim of the Line Creek Plateau and about 7.5 miles east of the nearest boundary of the Absaroka-Beartooth Wilderness. Use of this area is similarly restricted by the closure of Forest lands to motorized travel and the presence of privately-owned lands to the east that limit public access to the area. The Face-of-the-Mountain Trail lies within a few hundred yards of the drill site, and attracts a variety of dispersed recreation uses during the summer and fall hunting seasons.

Most recreation use of this area also occurs in conjunction with hunting during the fall, primarily during the elk archery and rifle seasons. Levels of elk hunting use in this location may be slightly lower than in the area surrounding the proposed drill site, particularly with respect to outfitter use during the archery season (Harrington 1988).

3.9 SOCIOECONOMICS

3.9.1 Proposed Action and Alternatives

The proposed action is located in southern Carbon County, Montana, approximately 2.8 miles north of the Wyoming border in a rural area. There is a ranch house and outbuildings located at the end of Grove Creek Road. There is also a seasonal cabin located about a mile off the proposed drill site near the Forest boundary. The bulk of the social and economic effects of this proposed well would therefore be diffused across the rural populations in Carbon County, Montana, and Park County, Wyoming.

The population of Carbon County, Montana, was 8,173 in 1977 and is estimated to have grown to a current level of 8,461, or 0.4 percent annually. The communities nearest the drill site, Red Lodge, Bear Creek, and Belfry (Exhibit 1-2), had 1980 populations of 1,896, 62, and 227, respectively. Given the county's population growth rate, the estimated current populations are Red Lodge, 2087; Bear Creek, 68; and Belfry, 250 (Bureau of the Census, 1985). The population density of Carbon County is approximately 4.9 people per square mile, 9.4 percent below the state average of 5.41 people per square mile (See Table 3-6).

Park County, Wyoming is immediately south of the project area and is predominately rural. The social and economic environment most likely to be affected by the proposal is Cody, which is the county seat and located 32 miles south-southeast of the proposed drill site (see Exhibit 1-2). Cody has a current estimated population of 7,494 and is the retail and social center for the county. Park County is sparsely populated, with only 5.9 people per square mile. Even at this low population density, the county is 20 percent above the Wyoming average of 4.8 people per square mile. The estimated population of Park County is 23,882 and is projected to grow at approximately 1.09 percent annually through 1996 (Wyo. Div. Res. and Stat. 1986).

AFFECTED ENVIRONMENT

Both Carbon and Park counties have historically experienced mineral and energy development. The bulk of the energy extraction in Carbon County is coal mining and dates back to 1877 when diggings were begun near the present site of Red Lodge. The prominence of Red Lodge as a coal producer was enhanced in 1889 by the completion of the Rocky Fork and Cooke City branch of the Northern Pacific Railroad. The dominant twentieth century coal development in Carbon County was the mine at Bear Creek. This mine was destroyed by fire in the late 1940's, ending the major coal producing era in the county.

The history of energy development in Park County begins later than in Carbon County, and a higher level of activity continues today. The industry in Park County is based not on coal but on oil and gas. One of the oldest producing fields in the country, the Oregon Basin, is in the eastern part of the county. Much of the private and public land has been exposed to either oil and gas leasing, exploration, or production. The additional exploration that this proposal represents is consistent with existing trends and will not require the population of Park County to alter the way it interacts with or perceives the natural environment.

Carbon and Park counties have relatively underdeveloped economies, with Carbon County the less well-off of the two. Carbon County has a much lower total personal income than does Park County: the former was only 27.4 percent of the latter in 1986 (Tables 3-7 and 3-8). The smaller population in Carbon County does not account for all of this difference because the per capita income is 21 percent higher in Park County. The difference is even more obvious if transfer payments, dividends, interest, and rents are removed from total personal income. In this case, Park County's 1986 per capita income is 54.6 percent larger than in Carbon County. Carbon County receives 22 percent of its total personal income from transfer payments (Social Security, federal pensions, etc.) while the state averages for Montana and Wyoming are 18 percent and 13 percent, respectively. The higher level of transfer payments to Carbon County residents may be due to a larger number of retirees, particularly elderly widows from the Bear Creek mine disaster.

Both Carbon and Park Counties draw substantial economic strength from mining (mainly oil and gas) and services (mainly tourism). In Carbon County, mining represents 10.4 percent of the non-farm private earnings for 1986, while services provide 30.7 percent. Mining represents 21.5 percent of the 1986 non-farm earnings in Park County, while services are 23.0 percent.

The level of earnings that these counties receive from mining has varied considerably in recent years, as Table 3-9 shows. The long-term earnings trend is downward for Carbon County (losing 35 percent nominally between 1980 and 1986) and upward in Park County (gaining 21 percent nominally over the same period). Both counties show substantial nominal increases in their earnings from services between 1980 and 1986: Carbon County was up 141 percent and Park County was up 98 percent.

The 1980 to 1986 increase in earnings from services can be attributed to long-term growth in the tourist industry. Tourism in Park County in the summer of 1987 was 7.2 percent above the comparable period in 1986 (Morey 1987), but probably declined substantially in 1988 because of the severe fire season in Yellowstone National Park. The residential populations in the counties grew slowly over that period--Carbon County up 0.4 percent per year and Park County up 2.6 percent per year--implying that the local need for services did not grow rapidly enough to account for the growth in service-related earnings. Moreover, these counties' shares of total earnings from services are higher than average for non-metropolitan regions of their states. These relationships support the conclusion that the bulk of the growth in services in these counties is attributable to tourism/recreation since neither population changes or statewide economic changes can account for it.

The relationship between the mining and tourism industries is an important and delicate one for these counties. Some area residents recognize their historical dependence on oil, gas, or coal, but they also see their future economic growth as being based on recreation/tourism. This transitional economic status means that additional hydrocarbon proposals are viewed as attractive, but are

Table 3-6. Populations of Montana and Wyoming, Non-Metro Montana and Wyoming, Carbon County, and Park County from 1977 to 1986.

Area	Year							
	1977	1980	1981	1982	1983	1984	1985	1986
Montana	771,342	788,282	795,756	805,040	815,801	823,473	825,453	818,928
Non-metro Montana	581,397	599,953	605,088	611,305	617,438	622,938	644,806	619,367
Carbon Co.	8,173	8,076	8,174	8,315	8,529	8,665	8,580	8,461
Wyoming	411,521	474,552	493,864	510,435	516,418	512,879	509,707	507,355
Non-metro Wyoming	350,001	402,092	347,870	361,846	366,223	364,794	363,87	5361,204
Park Co.	19,610	21,752	22,478	23,473	24,003	24,645	24,564	24,869

Sources: USDC 1984; USDC 1988

Table 3-7. Per Capita Personal Income for Montana and Wyoming, Non-Metro Montana and Wyoming, Carbon County, and Park County.

Area	Year							
	1977	1980	1981	1982	1983	1984	1985	1986
Montana	6,161	8,361	9,875	10,084	10,424	10,835	11,041	11,821
Non-metro Montana	5,895	8,044	9,571	9,664	9,980	10,333	10,541	11,435
Carbon Co.	5,524	7,637	9,119	9,253	9,109	9,289	9,857	10,691
Wyoming	7,535	11,040	12,332	12,236	11,836	12,244	12,914	12,774
Non-metro Wyoming	7,121	10,470	11,804	11,647	11,349	11,711	12,460	12,436
Park Co.	7,832	10,784	12,600	12,497	12,585	12,822	13,203	13,002

Sources: USDC 1984; USDC 1988

Table 3-8. Total Personal Income for Montana and Wyoming, Non-Metro Montana and Wyoming, Carbon County, and Park County (in $1000's).

Area	Year							
	1977	1980	1981	1982	1983	1984	1985	1986
Montana	4,752,237	6,590,829	7,858,105	8,118,020	8,503,906	8,922,334	9,113,826	9,680,542
Non-metro Montana	3,427,338	4,826,018	5,791,297	5,729,494	6,162,028	6,436,817	6,579,601	7,082,456
Carbon Co.	45,145	61,676	75,189	76,941	77,687	80,486	84,572	90,459
Wyoming	3,100,814	5,239,054	6,090,325	6,245,682	6,112,322	6,279,690	6,582,351	6,480,953
Non-metro Wyoming	2,492,359	4,209,906	4,106,262	4,206,717	4,156,268	4,272,097	4,533,887	4,491,934
Park Co.	153,584	234,572	283,225	293,342	302,080	315,993	324,316	323,347

Sources: USDC 1984; USDC 1988

Table 3-9. Earnings by Selected Industry for Montana and Wyoming, Non-Metro Montana and Wyoming, Carbon County, and Park County (in $1000's).

Area	Year							
	1977	1980	1981	1982	1983	1984	1985	1986
Montana								
Mining	129,611	234,312	326,826	289,520	242,132	246,940	234,538	210,012
Services	546,248	750,329	968,020	1,026,324	1,107,372	1,210,939	1,297,307	1,359,837
Civilian govt.	679,890	878,846	959,724	1,032,058	1,107,729	1,166,617	1,229,707	1,240,163
Non-metro Montana								
Mining	121,007	202,537	275,105	256,929	210.190	208,566	200,309	181,509
Services	369,458	504,218	621,870	656,877	707,974	769,230	829,870	NA
Civilian govt.	528,311	694,890	761,619	820,292	880,229	926,938	982,702	982,604
Carbon Co.								
Mining	NA	2,700	3,721	1,625	1,372	1,480	2,839	1,758
Services	NA	2,815	4,530	4,811	5,320	5,777	6,380	6,779
Civilian govt.	4,309	5,364	5,821	6,400	6,871	7,078	7,403	7,851
Wyoming								
Mining	523,615	1,021,545	1,226,809	1,188,455	1,039,526	1,032,187	1,002,734	826,182
Services	271,211	479,870	603,505	628,600	609,324	655,757	693,294	713,809
Civilian govt.	428,779	633,740	736,485	843,970	918,848	974,736	1,027,545	1,049,822
Non-metro Wyoming								
Mining	406,657	804,121	947,910	928,426	840,022	833,164	822,388	710,561
Services	204,498	324,289	385,309	385,298	378,616	409,212	436,463	449,663
Civilian govt.	372,146	548,972	479,327	541,200	609,589	649,908	687,966	711,394
Park Co.								
Mining	14,450	28,048	40,230	39,057	37,315	37,114	39,725	34,067
Services	15,032	18,091	32,719	34,219	32,967	36,565	35,848	35,867
Civilian govt.	21,981	28,873	32,075	34,844	38,922	45,386	49,152	51,060

Sources: USDC 1984; USDC 1988

likely to receive public support only if the unique physical environment can be preserved. This contrast between development and natural beauty is represented in the attitudes of the local population. Two opposing themes seem to characterize locals' attitudes about oil and gas or other resource

developments. One group supports relatively unconstrained development and is willing to accept alteration of the physical environment. Another group advocates maximum preservation of the existing environment and an implicit willingness to forego the economic opportunities associated with various resource developments, such as the proposed Ruby Creek project. Examples of both attitudes are represented in the comments received during the scoping process for this project and for previous oil well proposals on adjacent forests.

Associated with the low-development desires of part of the local population is a preference for continued growth in the local tourist/recreation industry. The assumptions behind this attitude are that tourists coming to the region are attracted by the natural environment and that a growing tourist industry will therefore make future economic expansion less likely to require extensive environmental modifications or major alterations of the small-town and rural lifestyles valued by many area residents.

There are some substantial qualitative differences in the tourism industries in Carbon and Park Counties. Both counties benefit greatly from their proximity to Yellowstone National Park, but Carbon County serves a regional clientele while Park County serves a more national one. US Highway 212 through Carbon County is a less heavily used major route into the park compared to the east entrance from Park County, Wyoming. The US Highway 212 access has been recently designated as an official scenic byway. Park County is adjacent to the east entrance to the park which is a more heavily used major route than Carbon County. Carbon County most importantly provides access to the Beartooth Plateau and the Absaroka-Beartooth Wilderness Area, which are used heavily by Montanans, particularly from the Billings/Yellowstone County metropolitan area. As such, changes in Carbon County's ability to accommodate tourists would be felt primarily at a regional level.

3.10 CULTURAL RESOURCES

3.10.1 Introduction

3.10.1.1 Prehistoric Period

The study area is at the extreme north end of the Bighorn Basin in the eastern foothills of the Beartooth Range. Cultural history begins with early human presence in the high Plains about 14,000 to 7,500 B.P. (before present, using 1950 A.D. as a base date). The earliest inhabitants are usually referred to as "Big Game Hunters," or the period in time called the "Paleo-Indian Stage." These populations are thought to have survived by hunting a rich and diversified fauna associated with the end of glaciation in North America (Frison 1978 and Bender 1983). They made elaborate fluted projectile points labeled Clovis and Folsum that are thought to be associated with thrusting spears. The end of the stage is marked by less elaborate, but more diversified in form, projectile points labeled the "Plano Complex," which seems to indicate the beginnings of specialization to changing environmental conditions.

The Beartooth Ranger District is relatively rich in finds from the Paleo-Indian period. The Red Lodge site, near the town of Red Lodge, Montana, while unstratified, has yielded several transitional "Yuma" points. False Cougar cave to the west of the project area contained the remains of extinct camels in a cultural context that may date to the Clovis period. In addition, surface finds of Clovis and Folsum have been made in nearby areas, particularly in the Pryor Mountains (Beckes and Kaiser 1983).

There are various hypotheses concerning the end of the Paleo-Indian Stage usually centered upon environmental changes and extinction of mega-fauna. Whatever the reasons, the succeeding "Archaic Stage" is characterized by specialized adaptation to an essentially modern environment. A hypothetical model, based largely upon a pattern of "high country adaptation," can be proposed for the higher elevation forests and labeled as the "Mountain Archaic." The Mountain Archaic is delineated in time by smaller, stemmed, side or corner notched varieties of projectile points. The bow and arrow appears approximately at the end of the Archaic Period. Trends during the Archaic include a greater increase in collecting foods

and a related development of a stone ground food processing technology. A generalized distinctive lacustrine focus of Archaic period behavior developed and was centered on the varied resources of the drainages of the Big Horn Basin and adjacent mountain ranges. The pattern of high country adaptation is a broader response to seasonal variations (Wright, Bender, and Reeve 1980). Primary base camps would be established in the spring and summer in lower elevations where particular flora and fauna species were present. As the summer progressed, the flora species would begin to bloom in the higher elevations. By moving the base camps to higher elevations, the hunting and gathering populations would be able to obtain second and third harvest of the same species. Settlement patterns would be base camps at the mouths of higher elevation canyons with use area sites scattered throughout. The model is quite applicable to increased hunting in the late Archaic as the larger game would also take advantage of the migrating flora. The wide ranging populations could utilize this life-style only if the population density remained sufficiently low to allow for such broad territories.

False Cougar Cave, the Red Lodge site and the East Rosebud Lake site are good examples of high country adaptation by small family bands. The numerous isolated finds and small site finds within the Beartooth Range may well reflect the use patterns associated with the base camps. Eventually, flora and fauna data on seasonality could link these units and develop a pattern of occupation associated with lower elevation sites.

The Mountain Archaic was the primary culture stage for most of the prehistoric period in the higher elevation portions of the Custer National Forest (Bender 1983). We do not begin to see significant change until about 1500 A.D. when the Late Prehistoric Period, with the addition of pottery and more sharply defined regional culture patterns, replaces the Archaic Period. The migratory equestrian populations competed with the pedestrian populations for the same resources, and, in most instances, displaced them.

3.10.1.2 Proto-Historic and Historic Periods

The Proto-Historic period begins when European influences began to have a major effect on the Native American life-style. Changes were rapid, pronounced, and irreversible. The first significant change was the Shoshone expansion from the Great Basin sometime around 1700 A.D. after they acquired the horse. The Shoshone, with their superior food processing economy, expanded into the Big Horn Basin and further north into Montana (McDonald 1983).

The eighteenth century witnessed the development of internecine warfare among the Native Americans. The Shoshone were periodically displaced by the Crow and Blackfeet. This brief period saw major developments in rock art, and perhaps, the beginning of Vision Quest and Cribbed Log structure sites.

The Shoshone held sway in the Bighorn Basin off and on until 1868 when they were relocated to the Wind River Reservation to the south. During the first half of the Nineteenth Century, the Shoshone continued their war with the Crow and Blackfeet. The Blackfeet did much to obliterate the bison on the high plains and in the Great Basin. When the bison were gone, the Blackfeet began to raid the trappers, Crow, and Shoshone for horses. This particular raiding pattern produced an alliance between the trappers and the Crow and between the trappers and the Shoshone that allowed them to drive the Blackfeet back to Montana. Periodic skirmishes between bands of various tribes occurred in the Big Horn Basin, and the influence of the Nez Perce was felt at one time.

After the Shoshone were placed on the reservation, the Basin was occupied by the Northern Arapaho under Chiefs Sharp Nose and Black Coal. The Arapaho were attacked by cavalry and Shoshone at Bates Battlefield east of Thermopolis, Wyoming, in 1874. Chief Sharp Nose sold the Hot Springs of Thermopolis (one of Shoshone Chief Washakie's favorite resorts) to the State of Wyoming in 1876. In 1877, the Arapaho were merged into the Wind River Reservation. The onslaught of Euro-American populations then began in earnest and witnessed the end of the dominance of the Native Americans.

The advent of the Historic Period in the Big Horn Basin dates in the vicinity of 1875-1895. The area had first been visited in 1807 by John Colter of the Lewis and Clark Expedition (Thompson 1985). In 1858, the

Mullan Road of the Corps of Engineers entered the Bighorn Basin from the north, roughly paralleling the Clarks Fork of the Yellowstone River. By 1864, the Bridger Trail had been established in the eastern portion of the Basin. Overlapping the Native American and Historic Periods was army scout and trapper John Dwight Woodruff, who built a cabin on Owl Creek in 1871, ostensibly for trapping. An agreement with Washakie allowed Woodruff to bring a large herd of sheep into the area in the early 1870s. The first cattle were introduced into the Big Horn Basin by John Carter in 1879.

Events to the west were soon to influence the Basin. In 1872, Yellowstone National Park was created followed by Fort Yellowstone in 1886 (Wright et al. 1978). In 1891, the Shoshone National Forest was established by President Benjamin Harrison, the first of the National Forests. In 1897, Buffalo Bill Cody established the town that bears his name and became a permanent resident of the basin.

Euro-American settlement of the Bighorn Basin was greatly enhanced by Burlington-Northern constructing a rail spur off the Northern Pacific to Red Lodge in 1890. The Meeteetse Stage Trail, founded in 1881 by the U.S. Army, was a stage and freight road that headed out of Billings, Montana, and ran south to Red Lodge, Montana, and Meeteetse, Wyoming. The Red Lodge to Meeteetse stretch was about 100 miles long. This was the first road for conveying mail, settlers, implements, and goods in the area. The Meeteetse Trail is in the project area east of the Custer National Forest boundary and is eligible for the National Register of Historic Places.

The true opening of the Big Horn Basin can be attributed to the Mormon colonization and the introduction of the railroad in the early 1900's. At the turn of the century, mining developer Sam Gebo was responsible for developing the mining interest east of Thermopolis that justified bringing a rail spur down from Frannie, near the Montana State line. By 1913, the predecessor of the Burlington-Northern Railroad had extended the line to Casper, Wyoming. This opened the market not only for coal, but for livestock and timber. By this time, the themes of development for the Bighorn Basin and surrounding environment had been established. Mining, stock raising, logging, wildlife use and management, and recreation are still ongoing themes.

3.11 HEALTH AND SAFETY

Health and safety concerns for the affected environment include primarily the risk associated with vehicular travel on graveled and unimproved roads and risks associated with low probability events such as floods, landslides, etc., as discussed in the Geology Section. The hazards associated with drilling and encountering hydrogen sulfide (H_2S) gas are discussed in Environmental Consequences, Chapter 4.

ENVIRONMENTAL CONSEQUENCES

Chapter 4

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Chapter 4

CHAPTER 4

4.0 ENVIRONMENTAL CONSEQUENCES

This chapter provides an analysis of the potential environmental consequences that could result from implementation of the Proposed Action, Ruby A Federal No. 1-9 Exploratory Oil/Gas Well (Ruby A Federal), and alternatives to the proposed action. This includes project components and associated actions such as access roads, drill sites, and exploratory drilling, testing of hydrocarbon bearing zones, and reclamation associated with Phillips' proposed exploratory well. Certain measures that would avoid or reduce impacts have been included by Phillips in their proposal as discussed in Chapter 2 and further presented in their Application for Permit to Drill (APD) for the drilling proposal. The following impact assessment takes these measures into consideration. Impact mitigation, including the measures proposed by Phillips in Chapter 2, are included in the Mitigation Summary sections of this chapter and in Chapter 5.

Phillips and the IDT, under the direction of the FS, have prepared a field development scenario based on Phillips' current knowledge of the geology of the Ruby prospect area. This discussion is presented in Appendix B and was developed to provide individuals concerned with field development with a basic understanding of what could be involved when developing the prospect and possible impacts to the various resources that could occur if field development were to proceed. The discussion of impacts provides mitigation needed to avoid or minimize these potential impacts. The field development information is based on seismic interpretations and established well control data from oil/gas fields to the northeast and southeast of the Ruby A Federal prospect. The field development scenario in Appendix B covers the probability of discovery, the stages of field development likely to be associated with the Phillips' proposal and the technical and environmental review process. As such, the discussion presented in Chapter 4 does not specifically address field development as this action is not a component of Phillips' proposal (Alternative A) at this time, nor is it a component of *the Alternative A Drill Site Variation or* Alternative B.

Since implementation of the No Action alternative would leave the existing environment unchanged with no impacts over and above those already occurring, this alternative is not discussed specifically under each resource element; however, consequences of the No Action alternative are discussed in detail in Section 4.12.

Additional technical detail on the environmental consequences is available in resource-specific technical reports available at the Forest Service (FS) offices in Billings and Red Lodge, Montana and in the Bureau of Land Management (BLM) offices in Miles City and Billings, Montana.

The description of the environmental consequences for each resource section in this chapter includes the following subsections:

- Introduction - A *brief* description of the type and range of potential impacts that could occur as a result of project implementation.

- Impact Significance Criteria - The type of impact and the threshold or magnitude at which an impact would be considered significant, thus warranting special attention such as special mitigation. These criteria are based on criteria from government regulatory standards and management directives, available scientific documentation, previously prepared environmental documents, and the professional judgement of resource specialists. The list of criteria is meant to be a "menu" of all possible thresholds or magnitudes at which point impacts become significant. Not all criteria were *relevant to or* used in the analysis but were retained to provide documentation that all potential significant impacts were considered.

- Direct and Indirect Impacts - An area-specific and site-specific impact assessment relative to the proposed action and alternatives. This section indicates which impacts are significant relative to the impact significance criteria.

- Impacts Summary - A comparison of direct and indirect impacts that would

occur under each alternative and between alternatives.

- o Cumulative Impacts - A description of impacts likely to occur due to this project in combination with other ongoing activities, recently constructed projects, and projects likely to be implemented in the near future.

- o Mitigation Summary - A brief summary of measures that could be applied to avoid or reduce impacts to levels not considered significant.

- o Unavoidable Adverse Impacts - Significant impacts that are unavoidable and cannot be mitigated and therefore would remain throughout the duration of the project and to some point beyond. Unavoidable adverse impacts weigh heavily in the agencies' decision-making process in regard to issuing required permits and authorization to proceed.

Where the proposed action would conflict with the current management direction as provided by the Custer National Forest Land and Resource Management Plan (LRMP) (USDA-FS *1987b*), and the Billings Resource Area RMP (USDI-BLM 1983), management consistency criteria are presented to identify whether a management conflict exists. These criteria are listed under each resource, where applicable.

4.1 AIR QUALITY

4.1.1 Introduction

Air quality could be impacted as a result of project construction and operation in the following ways: 1) suspended particulate matter generated from the road, drill site, and well construction activities; 2) accidental emissions of pollutants such as sulphur dioxide or hydrogen sulfide during exploratory well drilling; 3) accidental spills of volatile petroleum products; 4) emissions from construction machinery *and vehicles transporting equipment;* and/or 5) flaring of gas during well testing.

4.1.2 Impact Significance Criteria

The following criteria were used to determine the significance of impacts to air quality that could result from project implementation. Impacts to air quality would be considered significant if:

- o The accidental emission of hydrogen sulfide, sulfur dioxide, or other harmful compounds occurred in sufficient concentrations and duration to affect the health and safety of workers at the site, area residents, or visitors in the vicinity.

- o The emission of pollutants from any activities associated with the construction and operation of the proposed project exceeded the concentration threshold values set by the prevention of significant deterioration (PSD) and ambient air quality standards mandated by the Montana Bureau of Air Quality Rules and Regulations.

4.1.3 Direct and Indirect Impacts

The proposed project would not be expected to cause significant impact to the air quality of the project area or the region as indicated by several impact studies conducted on the effects of well and field development under similar circumstances in the Overthrust Belt area of the Middle Rocky Mountains (USDI-BLM 1984). Any increase in suspended particulate and equipment-generated pollutants would be temporary during construction, drilling, and reclamation. Natural dispersion rates of pollutants generated by the project, air circulation patterns characteristic of the area, and the low frequency of occurrence of air stagnation or inversion typical of the project area would minimize the development of concentrations in excess of the standards (ambient and prevention of significant deterioration) set by the State of Montana Air Quality Bureau Rules and Regulations in the project area. Therefore, the Class I area of Yellowstone National Park would not be affected. The only potentially significant impact would be an emission of sulfur dioxide or hydrogen sulfide during drilling or well testing. The quantities

of gases released during well testing would be small due to the highly controlled nature of such tests and therefore, would have minor impact on air quality. Released gas would be flared to reduce impacts to air quality and associated public and worker health and safety. In regard to a blowout, the potential of such an occurrence and a subsequent public safety hazard would be small since state-of-the-art prevention and safety measures would be implemented by Phillips as described in the APD and in detail in the Contingency and Evacuation Plan presented in Appendix E. These potential impacts are also discussed in the Health and Safety Section.

4.1.4 Impacts Summary

No significant impacts to air quality are expected as a result of project implementation. The level of impact would be indistinguishable for both alternatives, *the variation drill site* and routing variations discussed in detail in the Transportation Section.

4.1.5 Cumulative Impacts

The implementation of *either* alternative is not expected to add significantly to impacts that have occurred or that may occur to air quality due to other minimal on-going activities in the area. Appendix B discusses the cumulative impacts of well field development in the project area.

4.1.6 Mitigation Summary

Road watering, or use of *water additives* on roads, would prevent or minimize dust or suspended particulate problems. Implementation of Phillips' Contingency and Evacuation Plan presented in Appendix E *and the requirements of On-Shore Oil and Gas Order #2 (43 CFR 3160)* and drilling precautions described in the APD, such as blowout prevention equipment, would preclude the occurrence of significant impacts resulting from project implementation.

4.1.7 Unavoidable Adverse Impacts

No unavoidable adverse impacts to air quality are expected to result from project construction and operation in either short-term or long-term time frames.

4.2 TRANSPORTATION

4.2.1 Introduction

Transportation impacts resulting from the proposed action would involve potential changes in traffic volumes, service levels, and road safety; disproportionate costs of construction between routing variations and alternatives; and conformance with existing management direction in regard to roads on BLM-administered lands and private land as well as access to the Forest. The access route that is selected or permitted by the FS and BLM could determine the permanent transportation system routes for the project area. Issuance of the permit would have management implications and bearing on all transportation system users in the area, and provide opportunities to private landowners, county, state, and federal agencies. The use and management of the selected access route during project implementation would likely modify the existing condition.

4.2.2 Impact Significance Criteria

The following criteria were used to determine the significance of impacts to transportation due to the proposed action or alternatives:

- An increase in road traffic during project construction, drilling, and reclamation that would result in a long-term decrease in the service level (driver comfort and safety) of the existing roads.
- An increase greater than five percent in vehicle accident rate or probability.
- An increase by more than five percent in the road density on the Forest.

4.2.3 Direct and Indirect Impacts

4.2.3.1 Alternative A - Proposed Action

4.2.3.1.1 Phillips' Proposed Access Route (Variation A1)

An increase in traffic volume would result from road reconstruction and construction, drill site construction, drilling activities, project abandonment, and reclamation of disturbed areas. The magnitude of this

increase at any one time would depend on the time frame utilized to implement the project. Phillips would prefer completing the project in one construction season but has planned to complete the project in two seasons, if necessary. The timing *and magnitude* of increased traffic volumes, therefore, would depend on the number of seasons needed to construct the project.

During the period of project drill pad construction and road reconstruction and construction, increased traffic volume would average 15 vehicles per day (vpd), round trip, with peak days of 30 vpd. During periods of erecting and dismantling drilling equipment, round trip traffic volume would average ten vpd, with peak days of 20 vpd. During drilling operations, round trip traffic volume would average five vpd; during abandonment and reclamation, traffic would average ten vpd.

Montana Highway 72 is the primary route for accessing the project area (Exhibits 1-1, 1-2 and 3-2). According to the Montana Highway Department, these increases in traffic volumes would not lower the existing driver comfort (Service Level B) of Highway 72 or substantially increase the accident probability (Kovich 1989 and Butzlaff 1989). Further, the increased truck travel is not expected to degrade the road surface or require special maintenance of the highway during project implementation.

The increase in traffic volumes on Grove Creek Road could cause short-term decreases in the service level since existing road users seldom encounter heavy truck traffic. Although there are no use data for this road, most users are local residents, farmers, and ranchers. Since the road offers excellent sight distance and the increase in traffic volume would be short-term, no significant impact to existing users in terms of driver comfort level or increase accident probability are anticipated. Further, warning signs would be posted, and escort vehicles would be used to alert road users about the increased heavy truck traffic during rig-up and rig-down operations. These measures would minimize any short-term decrease in driver comfort or any increase of accident probability on Grove Creek Road. Since Grove Creek Road would require no improvement, no capital expenditures would be required.

From the end of Grove Creek Road to the end of the existing unimproved "two-track" road, 8.8 miles of major road reconstruction would be required. Major or heavy reconstruction includes cutting and filling to widen the existing roads to a flat, 14-foot running surface; providing intervisible turnouts; and placing adequate drainage control structures such as drainage ditches, cross drains, and culverts where needed. All drainage control structures would be designed to carry surface runoff generated by 50- to 100-year storm events. All cut and fill slopes would be stabilized as soon as possible after disturbance as discussed in Appendix D which presents the site-specific erosion control, revegetation, and rehabilitation plan for the project.

The road surface would be graded and surfaced with gravel. Phillips would prepare an access road construction plan presenting the details of major road reconstruction and would submit this plan to the FS and BLM for approval. Portions of the existing road would require minor realignment at "topographically tight" positions. Existing road reconstruction of this magnitude would require an expenditure of approximately $3,000/mile for a total of approximately $26,400 as summarized in Table 4-1. These assumed costs are based on comparable construction situations on similar projects in the region.

No impact to existing traffic is anticipated on this segment of the access route since the existing users are private landowners who would authorize Phillips' use of this road via a legal right-of-way across the 5.6 miles of private land (See Table 3-1). Phillips would need to obtain a permit from the BLM authorizing reconstruction of the existing unimproved two-track roads across the 2.4 miles of BLM-administered land (See Table 3-1). Project traffic could impact people using Meeteetse Trail road where the access route crosses this road (Exhibit 3-2). Warning signs, including stop signs, would be erected to inform users of the Meeteetse Trail of the heavy truck traffic, thereby limiting any short-term reduction in driver comfort or

increase in accident probability. Public access beyond the Meeteetse Trail during project implementation would be prohibited. New road and the reconstructed portion of the existing road on the Forest would be fully reclaimed and revegetated upon project termination. Reclamation on disturbed BLM-administered lands would be as specified by the BLM. Reclamation on fee lands would be as per negotiated agreement with the private land owners along the access route.

New road construction on the Forest would require approximately 0.15 miles of standard road construction and 0.15 miles of bench cut and end haul construction across the 50 to 60 percent side slope near the drill site. The cost of standard road construction would be approximately $5,000/mile while the cost of bench cut and end haul construction would be approximately $25,000/mile. Total cost of new road construction would be $4,500 as summarized in Table 4-1. Bench cut and end haul road construction is preferable to standard sidecast construction. Sidecast construction would disturb a larger area on the 50 to 60 percent sideslopes. Further, reclamation of this larger area would be more difficult due to the inability of construction equipment (i.e., trackhoe) to reach to the bottom of the fill slope. Bench cut and end haul construction, on the other hand, would disturb a substantially smaller area and would have a higher possibility of successful reclamation.

During project implementation, use of this road would be restricted to project-related traffic and Forest business through the use of a gate guard either positioned at the Meeteetse Trail or the Forest boundary. Private landowners/lessees would be permitted to access their property. If producible quantities of oil and gas were encountered, the access road would be gated to preclude unauthorized access to the drill site during the two- to three-year interim period that would occur while an additional NEPA document (i.e., environmental assessment or environmental impact statement) was prepared and a decision by the FS and BLM was made in regard to development. Upon project termination, this section of the new road would be "put to bed" by full reclamation and revegetation per the plan presented in Appendix D. Implementation of this access alternative would not increase road density within the Forest by more than five percent. The total construction cost for this alternative would be approximately $30,900 as summarized in Table 4-1. This expenditure would not directly benefit the existing public transportation system in the project area. This is an important circumstance that the FS and BLM would consider in the decision making and permitting process.

Upon termination of Phillips' exploration project, FS designation of this route as a public access route to the Forest boundary would assist in meeting Forest-wide management direction or objectives of official access every five miles. Such designation would require the FS to obtain legal right-of-way across private land and to coordinate with the BLM on BLM-administered land. The FS would likely construct a trailhead at the end of the road (Forest boundary) providing parking, livestock loading and unloading facilities, and signs indicating that no motorized travel is allowed beyond the trailhead.

4.2.3.1.2 Meeteetse Trail - Robertson Draw Access Route (Variation A2)

The Meeteetse Trail - Robertson Draw access variation would be the same as discussed under Variation A1 to the end of Grove Creek Road. From this point, approximately 1.6 miles of unimproved two-track road would need upgrading as described previously to reach the Meeteetse Trail (Exhibit 3-2). This access variation would follow the Meeteetse Trail for 5.1 miles to reach Robertson Draw Road and proceed approximately 5.7 miles on Robertson Draw Road. A total of 10.8 miles of existing improved road would require minor reconstruction. This reconstruction would entail minor shaping, blading, improved drainage control, and construction of intervisible turnouts. All these activities would be restricted to the disturbance zone of the existing road. All drainage control structures would be designed to carry surface runoff generated by 50- to 100-year storm events. The road surface would be graded and surfaced with gravel. Phillips would present the details of road reconstruction in an access

road construction plan that they would submit to the FS, BLM, and Carbon County Commissioners for approval. The cost of implementing this reconstruction would be approximately $2,000/mile for a total of $21,600 as summarized in Table 4-1.

From Robertson Draw Road, access would follow an existing unimproved two-track road for 1.3 miles to where this variation merges with the A1 variation near Mill Draw (Exhibit 3-2). From this point, an additional 3.9 miles of existing unimproved two-track road would be utilized. Approximately 6.8 miles of these two-track roads, including the 1.6 miles at the end of Grove Creek Road, would require major reconstruction at $3,000/mile for a total of $20,400 as summarized in Table 4-1. From the end of the unimproved two-track road, new road construction, as described under A1, would be required. The total cost of constructing this access variation would be approximately $46,500. Approximately $21,000 of this total would be utilized in minor improvement of the Meeteetse Trail and Robertson Draw roads. This improvement would benefit the existing transportation system in the project area.

Although there are no use data for these roads, traffic volumes are expected to be low for the Meeteetse Trail and consist primarily of local ranchers and farmers, and some recreationists. Robertson Draw Road also receives low use; however, more recreationists and FS personnel use this road than the Meeteetse Trail since Robertson Draw Road is an officially designated access route to the Forest. Since these roads currently do not receive heavy truck travel, current users of these roads could be bothered by the presence of heavy truck traffic associated with this variation. There would be a short-term decrease in the driver comfort of this road; however, warning signs would be posted and front and rear escort vehicles would be used to alert road users about the increased heavy truck traffic. These measures would minimize any short-term decrease in driver comfort and any increase of accident probability.

Minor reconstruction of Meeteetse Trail road could destroy historical artifacts left by the early users of this trail. Cultural clearance of this route would be required prior to construction to avoid the destruction or loss of these cultural artifacts (See the Cultural Resources Section).

No impact to existing traffic is anticipated on the unimproved two-track road segment of the access route since the existing users are private landowners who would authorize Phillips' use of this road via a legal right-of-way across the 4.7 miles of private land (See Table 3-1). Phillips would need to obtain a permit from the BLM authorizing reconstruction of the existing unimproved two-track roads across the 1.3 miles of BLM-administered land (See Table 3-1). Public access beyond Robertson Draw Road during project implementation would be controlled and restricted at several possible points along the route. These points include where the route deviates from the Robertson Draw Road, where the route enters Ruby Creek canyon, or at the Forest boundary. New road and the reconstructed portion of the existing road on the Forest would be fully reclaimed and revegetated upon project termination. Reclamation on disturbed BLM-administered lands would be as specified by the BLM. Reclamation on fee lands would be as per negotiated agreement with the private land owners along the access route.

Upon termination of Phillips' exploration project, FS designation of this route as an public access route to the Forest boundary would assist in meeting Forest-wide management direction or objectives of official access every five miles. Such designation would require the FS to obtain legal right-of-way across private land and to coordinate with the BLM on BLM-administered land. The FS would likely construct a trailhead at the end of the road as described under Alternative A1.

4.2.3.1.3 Southern Access - Robertson Draw Access Route (Variation A3)

The Southern Access - Robertson Draw access route originates from Highway 72 at a county improved road leading to where Robertson Draw and Meeteetse Trail roads converge. This is the primary route to access Robertson Draw Road and the Forest 9.0 miles beyond. In the initial 1.5 miles of this improved road

Table 4-1. Cumulative Distances and Costs Associated with Constructing and Rehabilitating Access Route Variations and Alternatives.

Road/Feature	Unit Cost[b] $K[d]/mi	Alternative A[a] A1[c] miles	A1[c] $K	A2 miles	A2 $K	A3 miles	A3 $K	A4 miles	A4 $K	Alternative B miles	Alternative B $K
Existing Roads											
No Reconstruction	0	5.0	0.0	5.0	0.0	1.5	0.0	7.6	0.0	5.0	0.0
Minor Reconstruction	2	0.0	0.0	10.8	21.6	5.6	11.2	0.9	1.8	0.0	0.0
Major Reconstruction	3	8.8	26.4	6.8	20.4	5.8	17.4	9.2	27.6	5.3	15.9
Subtotal	-	13.8	26.4	22.6	42.0	12.9	28.6	17.7	29.4	10.3	15.9
New Roads											
Standard Construction											
50 Percent Sideslopes	5	0.15	0.75	0.15	0.75	0.15	0.75	0.15	0.75	0.0	0.0
Bench cut/end haul	25	0.15	3.75	0.15	3.75	0.15	3.75	0.35[e]	8.8	0.0	0.0
(Side Cast)	(20)	(0.15)	(3.0)	(0.15)	(3.0)	(0.15)	(3.0)	(0.15)	(4.0)	(0.0)	(0.0)
Special Handling of Boulders	13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	11.7
Subtotal	-	0.3	4.5	0.3	4.5	0.3	4.5	0.5[e]	9.6	0.9	11.7
TOTAL	-	**14.1**	**30.9**	**22.9**	**46.5**	**13.2**	**33.1**	**18.0[e]**	**39.0**	**11.2**	**27.6**
Bridge											
Reconstruction	-	-	-	-	-	-	166.0	-	-	-	-
New Construction	-	-	-	-	-	-	(470.0)	-	-	-	-
Subtotal	-	-	-	-	-	-	199.1	-	-	-	-
	-	-	-	-	-	-	(503.1)	-	-	-	-

a - Alternative A Drill Site Variation would not involve 0.3 miles of new road construction (0.15 miles of standard construction and 0.15 miles of benchcut and end haul construction) and 0.4 miles of major reconstruction of existing roads common to each access variation with a resultant decrease in cost of $5,700.

b - Unit costs are based on similar construction situations on similar projects in the region.

c - Phillip's proposed access route.

d - K = $1,000.

e - Includes 0.2 miles of bench cut/end haul construction along existing road.

there is a steel bridge crossing of the Clarks Fork. This bridge has an eight ton load limit. Since most heavy truck traffic involved with road construction, drilling, and reclamation exceeds the eight ton load limit, this alternative would either require bridge reconstruction at an approximate cost of $166,000 or the construction of a new bridge at an approximate cost of $470,000 as discussed in detail in Appendix C. Except for the bridge, this portion of the access route would not require improvement or reconstruction.

From where the Meeteetse Trail and the Robertson Draw Road converge, this route follows the same roads to the drill site as described for Variation A2 (Exhibit 3-2). Therefore, the same considerations in regard to required road improvement or reconstruction, driver comfort, and accident probability apply. This access route variation would cost approximately $11,200 for minor reconstruction of Robertson Draw Road, $17,400 for the major reconstruction of unimproved two-track roads, $4,500 for new road construction, and from $166,000 to $470,000 for bridge construction. The total cost for this variation, depending on whether the bridge is reconstructed or whether a new bridge is constructed, would range from $199,100 to $503,100 as summarized in Table 4-1. Of this total cost, approximately $11,200 would be utilized in minor improvement of the Robertson Draw Road, and as indicated from $166,000 to $470,000 would be utilized to either repair or replace the bridge over the Clarks Fork. These potential expenditures would benefit the existing public transportation system in the project area.

Upon termination of Phillips' exploration project, FS designation of this route as a public access route to the Forest would assist in meeting Forest-wide management direction or objectives of official access every five miles. Such designation would require the FS to obtain legal right-of-way across private land and to coordinate with the BLM on BLM-administered land. The FS would likely construct a trailhead at the end of the road as described under Alternative A1.

4.2.3.1.4 Clark Wyoming Access Route (Variation A4)

The Clark Wyoming access route originates from Wyoming Highway 120 and follows improved county roads for 5.0 miles towards Clark, Wyoming (Exhibits 1-2 and 3-2). These improved roads would not require reconstruction. The discussion presented under Variation A1 for Montana Highway 72 and Grove Creek Road in regard to driver comfort and accident probability also applies to this variation.

From the end of the county road, this access route proceeds approximately 6.4 miles of unimproved two-track road to Robertson Draw Road. A portion of the route would require bench cut and end haul over a distance of approximately 0.25 miles where the route traverses steep and abrupt terrain at an average gradient of 15 percent. This portion of the access route would traverse approximately 4.9 miles of private land.

Phillips would need to obtain legal right-of-way across private land as well as a permit from the BLM authorizing reconstruction of the existing unimproved two-track roads across BLM-administered land.

From Robertson Draw Road, this access variation follows the same unimproved two-track roads and new road construction to the drill site as described under Variations A2 and A3; therefore, the same considerations in regard to required road improvement or reconstruction, driver comfort, and accident probability apply. The total cost of construction for this route would be approximately $39,000. Of this total, approximately $1,800 would be spent improving a 0.9-mile portion of the Robertson Draw Road.

Upon termination of Phillips' exploration project, FS designation of this route as an public access route to the Forest would assist in meeting Forest-wide management direction or objectives of official access every five miles. Such designation would require the FS to obtain legal right-of-way across private land.

The FS would likely construct a trailhead at the end of the road as described under Alternative A1.

4.2.3.1.5 Alternative A Drill Site Variation

Access road routing variations for the Alternative A Drill Site Variation would be the same as those discussed under Alternative A, with two exceptions. No new road construction on Forest lands would be required for this drill site variation (0.15 mile of standard road construction and 0.15 mile of bench cut and end haul construction), and 0.4 miles less of major reconstruction of existing unimproved roads would be required with a resultant decrease of $5,700 in construction cost for each access route variation. Increases in traffic volume resulting from road reconstruction and construction would be similar to those discussed for Alternative A.

4.2.3.2 Alternative B - Gold Creek Site

Access *to* Alternative B would be the same as discussed under Alternative A, Variation A1, to the end of Grove Creek Road in regard to impacts on driver comfort, accident probability, and maintenance for Montana Highway 72 and Grove Creek Road. From this point the access route would require major reconstruction of approximately 5.3 miles of unimproved two-track roads to the abandoned Amoco drill site. Existing road reconstruction of this magnitude would require approximately $3,000/mile for a total of approximately $15,900 as summarized in Table 4-1.

No impact to existing traffic is anticipated on this segment of the access route since the existing users are private landowners who would authorize Phillips' use of this road via a legal right-of-way across the 3.4 miles of private land (See Table 3-2). Phillips would need to obtain a permit from the BLM authorizing reconstruction of the existing unimproved two-track roads across the 1.9 miles of BLM-administered land (See Table 3-2). Use of this road by project traffic could impact users of the Meeteetse Trail road where the access route crosses this road (Exhibit 3-2). Warning signs, including stop signs, would be erected to inform users of the Meeteetse Trail of heavy truck traffic.

Such measures would limit any short-term reduction in driver comfort and any increase in accident probability. Public access beyond the Meeteetse Trail during project implementation would be prohibited.

Major reconstruction of the 5.3 miles of unimproved two-track road would cost approximately $15,900. Major road reconstruction was defined previously under Alternative A. Phillips would present the details of this reconstruction in an access road construction plan and submit this plan to the FS and BLM for approval. Construction of approximately 0.9 miles of new road on the Forest would require special handling of large boulders to facilitate successful reclamation. The cost of road construction would be approximately $13,000/mile for a total cost of new road construction of $11,700. Upon project termination, this section of the new road would be "put to bed" by full reclamation and revegetation per the plan presented in Appendix D. Implementation of this access alternative would not increase road density within the Forest by more than five percent. Public access would be controlled and restricted at several potential points including where the route crosses the Meeteetse Trail, where the route enters Gold Creek canyon, or at the Forest boundary. Implementation of this access alternative would not increase road density within the Forest by more than five percent. The total cost of constructing this access alternative would be approximately $27,600 as summarized in Table 4-1. This expenditure would not directly benefit the existing public transportation system in the project area.

Upon termination of Phillips' exploration project, FS designation of this route as a public access route to the Forest boundary would assist in meeting Forest-wide management direction or objectives of official access every five miles. Such designation would require the FS to obtain legal right-of-way across private land and to coordinate with the BLM on BLM-administered land. The FS would likely construct a trailhead at the end of the road as described under Alternative A1.

4.2.4 Impact Summary

Impacts from the proposed project would involve potential changes in traffic volumes, driver comforts, and road safety; disproportionate costs of construction between routing variations and alternatives; and conformance with existing management direction in regard to roads on BLM-administered lands and private land as well as access to the Forest boundary. Significant impacts are not expected to occur under any alternative or variation with implementation of appropriate safety precautions such as warning signs and escort vehicles. The primary difference between the alternatives and access route variations includes disruption of recreational use of existing improved county roads and construction costs, and whether construction costs were spent on the existing public transportation system or on private roads. Although the short-term increase in traffic volumes and accident probability and the decrease in driver comfort were determined non-significant, important contrasts between the variations can be made. Of the Alternative A routing variations, Phillips' proposed access (Variation A1) would impose the smallest impact to existing users of county improved roads (i.e., Meeteetse Trail road) and would cost the least to construct as indicated in Table 4-1. Impact to existing users of Robertson Draw Road under Variation A4 would exceed the impact of Phillips' proposed access route due to the slightly heavier levels of recreational use along Robertson Draw Road compared to the Meeteetse Trail road.

In contrast, both Variations A2 and A3 would impose the greatest impact to users of these roads, with Variation A2 causing the greatest impact overall. Table 4-1 summarizes the cost of implementing the access alternatives and variations. Variation A3 would be the most expensive to construct due to reconstructing the existing bridge over the Clarks Fork. Variation A4 would be the next most expensive variation due to the greater length of unimproved two-track roads needing major reconstruction, followed by Variation A2 due to the great length of minor reconstruction of existing improved roads. Of the Alternative A variations, Variation A1, which is Phillips' proposed access route, would be the least expensive. Alternative B would cost $3,300 less than Phillips' proposed access route, would be the least expensive access route to construct, and would cause the least impact overall. Total expenditures for each access route variation and alternative would disproportionately benefit the existing public transportation system in the project area. Access route Variations A2 and A3 would benefit the existing transportation system the most, unless public access right-of-ways were obtained by the FS and BLM for Variation A1 or Alternative B. The permitted access route would determine the major access in the project area as the road would likely be maintained for use in the future. None of the access route alternatives or variations would significantly increase road density in the project area since construction off Forest lands would only involve existing roads and new road construction on Forest lands would only involve 0.3 miles and 0.8 miles for Alternative A Access Routes and Alternative B, respectively. *Implementation of the variation drill site would preclude the need for 0.3 miles of new road construction and 0.4 miles of major reconstruction of unimproved existing roads on the Forest with a resultant decrease of approximately $5,700 for each variation.*

4.2.5 Cumulative Impacts

No significant cumulative impacts are expected to occur from project implementation. No projects with associated heavy truck traffic that utilize the same access routes are known to occur or are planned for the project area. There is a chance that the planned improvement of Montana Highway 72 during the 1989 construction season could intensify short-term impacts on traffic caused by the proposed project; however, these impacts are not expected to be significant. Appendix B discusses impacts due to field development and suggests that cumulative transportation impacts would be substantial during construction and development of the field (12 years). After construction is completed, traffic would decrease and would not be substantial during project operation.

4.2.6 Mitigation Summary

The placement of warning signs at strategic locations, the use of escort vehicles during

construction activities on all roads, and construction of intervisible turnouts would minimize short-term impacts in regard to a decrease in driver comfort or an increase in accident probability. Gate guards to restrict non-project traffic from the private portion of the roads or from the drill site would further minimize potential impacts. Phillips would be required to submit an access road design plan to the FS, BLM, and Carbon County Commissioners for approval prior to the agencies issuing a permit for right-of-way access.

4.2.7 Unavoidable Adverse Impacts

Unavoidable adverse impacts are not expected to occur as a result of implementing the proposed action or alternatives, assuming the suggested precautions are implemented (e.g., warning signs, escort vehicles, and gate guards).

4.3 GEOLOGY/SOILS

4.3.1 Introduction

4.3.1.1 Geology

Impacts that could occur within the project area fall into two general categories: 1) impacts to the geologic environment caused by project construction and operation, and 2) impacts to project facilities (including access roads) as a result of inherent geologic hazard or risk in the project area. Impacts to the geologic environment include alteration of existing topography, altering or otherwise damaging other mineral leases that may occur in the project area, initiation of landslides and mass failures, and alteration or destruction of paleontological remains. Impacts that could occur to the project primarily include inherent geologic risk or hazard such as damage to project facilities due to earthquakes, landslides, mass failures and movement of earth material. *Further, Phillips' opportunity to successfully investigate and test the target geologic structure could be diminished if drill sites other than the proposed were implemented.*

4.3.1.2 Soils

Potential impacts that could occur as a result of implementation of the proposed project include the removal of vegetation, exposure and disturbance of soil and mixing of soil horizons, the subsequent increase in the susceptibility of soil to wind and water erosion, and subsequent loss of the soil resource. Increased surface runoff and erosion would occur primarily in the short-term and would decline naturally in time due to natural stabilization and surface crusting, as well as in response to properly spaced drainage structures, sediment control structures where needed, and mulching and seeding to promptly re-establish vegetation on disturbed areas. The exposure and disturbance of soil combined with the loss of soil due to erosion could reduce the quantity and productivity of topsoil for reclamation.

Topsoil would be segregated for revegetation purposes to assure that the natural fertility and reclamation potential of the soil are not reduced. On steep sideslopes, long sliver fills would need to be avoided so that soil material is not sidecast beyond the reach of equipment for reclamation. Avoidance of long sliver fills would also decrease the length of slope exposed to erosion. Indirect impacts to soils could occur from rutting and compaction from off-highway vehicles (OHV) as the result of increased vehicular access along the road into areas that currently have no or poor accessibility.

4.3.2 Impact Significance Criteria

The following significance criteria were used to determine the significance of impacts to the geology and soils due to the proposed action or alternatives:

Geologic Environment:

- o New and/or reactivated landsliding occurred due to geomorphic changes resulting from project construction causing significant resource damage and/or affecting worker and public safety.

- Large scale topographic alteration occurred causing other related impacts such as on the visual resource.

- The destruction of paleontologic remains that would substantially add to the body of knowledge on paleontologic resources in the area.

Geologic Hazards:

- Earthquake induced strong vibratory ground motion capable of damaging project facilities occurred during project construction or operation, exposing workers and public to abnormal levels of safety risk or hazard.

- Avalanches, landslides, or debris flows occurred independently of project construction and operation which could result in damage to project facilities, and abnormally increased worker and public safety hazard.

Soils:

- Implementation of the proposed action or alternatives would violate forest-wide management direction and/or management area direction as described and mandated by the Custer National Forest LRMP and EIS (USDA-FS 1987b) and the Billings Resource Area RMP (USDI-BLM 1983), respectively.

- Increased soil erosion that cannot be reduced by 75 percent after one year, and 95 percent after five years of soil disturbance due to project activities.

- Productivity of the reclaimed soil does not equal that of the predisturbance soil as indicated by success of revegetation (i.e., vegetal cover) such that predisturbance land use can occur.

- Construction on soils with moderate to high stability hazard.

- Prime farmlands, or farmlands of state and/or local importance are impacted.

4.3.3 Direct and Indirect Impacts

4.3.3.1 Alternative A - Proposed Action

4.3.3.1.1 Access Route

4.3.3.1.1.1 Geology

Since the inherent geologic hazards in the project area do not pose significant danger or public safety hazard, impacts related to natural geologic hazards would unlikely occur due to access road construction. Minimal topographic alteration would occur with access road construction. The 0.3 miles of new road construction across 50 *to 60* percent slopes would cause some topographic alteration; however, the magnitude would be small. *In general,* access road construction and reconstruction would not incite landslides, mudslides, debris flows, slumps, or avalanches. *However, new road construction across the 50 to 60 percent slopes could cause small slumps and/or sloughs of limited extent. These areas could be easily stablized and reclaimed due to their limited extent.* The potential for encountering paleontologic remains during access road construction would be small due to the minimal excavation required to construct and reconstruct access roads. If these remains are encountered, Phillips would notify the FS and BLM to determine the significance of the find and determine appropriate mitigation if required. The potential for damage of project facilities due to earthquakes would be minimal as discussed in Chapter 3. Impacts related to implementation of the Alternative A access route variations (A2, A3, and A4; Exhibit 3-2) described in the Transportation Section would be similar to those described for Phillips' proposed access route (A1).

4.3.3.1.1.2 Soils

No road upgrade or reconstruction of the Grove Creek Road is expected, and therefore, no impacts to soils would occur along this five-mile segment of access route. Prime farmlands would not be impacted. The reconstruction required on most of the 8.8 miles of existing unimproved two-track roads

would disturb approximately 21.3 acres of soil assuming a 20-foot-wide construction zone. This disturbance would primarily involve expansion of cut and fill slopes on relatively gentle (5 to 15 percent) sideslopes to accommodate a wider running surface and optimal placement of drainage control structures such as culverts and ditches. As indicated in Table 3-2, most of the soils have relatively high permeabilities, low runoff potential, and low to moderate erosion potential such that significant erosion is not expected. Although much of the soils have an unsuitable to poor rating for a source of gravel and road subgrade, these limitations are not expected to be significant for the relatively small scale of road reconstruction and new road construction, and the intended use of these roads. Successful reclamation of cut and fill slopes should be attainable although the relatively poor reclamation potential (Table 3-2) of the low fertility and high coarse fragment soils would require aggressive reclamation techniques to maintain soil productivity. Further, the high coarse fragment content could hamper selective topsoil salvage and handling.

The Universal Soil Loss Equation (USLE) (USDA-FS 1980a) was used to estimate soil erosion rates. The results of this procedure indicated that increased erosion could be reduced to levels not considered significant. Unprotected surface soils would likely have an average erosion rate of approximately 11 tons/acre/year. Assuming best management practices including an aggressive revegetation and erosion control program, erosion would be reduced to one ton/acre/year after one year, which represents a 90 percent reduction in erosion. After five years, erosion would be reduced to approximately 0.5 tons/acre/year due to complete revegetation, representing a 95 percent reduction. Best management practices include protecting all disturbed areas with mulch, netting, and/or revegetation, depending on site-specific conditions, as soon after initial disturbance as possible during construction, drilling, and reclamation; controlling all surface runoff; and treating all runoff from the disturbed areas with sediment traps and silt fences. Best management practices relevant to this project are presented in several information sources including the USDA-FS Region 1 Soil and Water Conservation Handbook (FS Handbook 2509.22), and the joint BLM and FS "Gold Book" or Oil and Gas Reclamation Handbook (USDI-BLM and USDA-FS 1988). These information sources were used to prepare a site-specific erosion control, revegetation, and rehabilitation plan for the project. This plan is presented in Appendix D. No slope stability problems are anticipated along this portion of the access road since stability hazard is low; therefore, no significant impact to soils is anticipated.

Construction of approximately 0.3 miles of new access road from the terminus of the existing road to the drill site would disturb approximately 1.5 acres of soil, of which 0.75 acres would entail steep soil with moderate stability hazard along an 800-foot segment with 50 to 60 percent slope. Erosion and the potential for slope instability along the balance of this segment would be similar to that described previously for the access route along existing unimproved two-track roads. Further, the high coarse fragment content along this segment of new road construction could hamper selective topsoil salvage and handling. Blasting of bedrock would be likely along this segment of new road construction due to the shallow depth to bedrock, however, blasting would not be extensive due to the highly fractured and weathered nature of the surficial bedrock. Successful reclamation should be attainable although the relatively poor reclamation potential of the low fertility and high coarse fragment soils would require aggressive reclamation techniques to maintain soil productivity. No significant impacts are expected to occur. If producible quantities of oil or gas are not encountered, the drill site would be abandoned and reclaimed, and the new access road from the Forest boundary to the drill site would be recontoured and reclaimed. If producible quantities were encountered, the cut and fill slopes of the new road would be secured for a two- to three-year interim period while additional environmental analysis (i.e., environmental assessment and/or environmental impact statement) was conducted and the FS and BLM reached a decision concerning well production and field development. The cut and fill surfaces of the road would be secured from erosion as specified in Appendix D.

The results of the USLE procedure indicated that increased erosion along this steep 800-foot segment of road could be reduced to levels not considered significant. Unprotected surface soils would likely have an average erosion rate of approximately 25 tons/acre/year. Assuming best management practices discussed previously, erosion would be reduced to three tons/acre/year after one year, representing an 88 percent reduction in erosion. After five years, erosion would be reduced to approximately 1.5 tons/acre/year due to complete revegetation, representing a 95 percent reduction. Construction along this steep section of access road would require extensive cut and fill. Long sliver fills would need to be avoided so that soil material is not sidecast beyond the reach of equipment for reclamation. Avoidance of long sliver fills through the implementation of bench cut and end haul construction could decrease the length of slope exposed to erosion. The inherent moderate to high stability hazard associated with this 800-foot segment of road could result in minor slumps and sloughs during wet years. If optimal drainage control is implemented, problems related to instability would not likely occur. The balance of new road, or 800 feet, to the drill site would traverse relatively gentle slopes (10 to 20 percent) with low stability hazard, and erosion similar to that previously described. Successful reclamation should be attainable although the relatively poor reclamation potential of the low fertility and high coarse fragment soils would require aggressive reclamation techniques to maintain soil productivity.

No significant impacts are anticipated to occur due to implementation of any of the Alternative A routing variations (Exhibit 3-2). As indicated in the Soils Section of Chapter 3, these routing variations traverse the same soil mapping units in similar proportions as described for the proposed access route (A1). Of particular importance in regard to impacts on the soils environment include erosion potential or hazard and revegetation potential. Due to the same soil mapping units being traversed, the type and magnitude of impacts would be similar to those described previously for Phillips' proposed access. Variation A3 would involve the least disturbance (15.5 acres), followed by Variation A2 (18.0 acres), Phillips' proposed access road (A1) (22.8 acres), and Variation A4, which causes the greatest disturbance (23.8 acres). The difference between each variation is not considered substantial since the impacts associated with the disturbances would be fully mitigable through implementation of best management practices as discussed previously.

4.3.3.1.2 *Proposed* Drill Site

4.3.3.1.2.1 Geology

The discussion presented above for the access route also applies to the drill site. Based on currently available technical information and the interpretation of the size, location, and orientation of the target geologic structure, Phillips believes that the Ruby Creek drill site would provide them with the best opportunity of successfully reaching the target at the intended angle of approach as shown on Exhibit 2-6 and discussed in Section 2.2.3 of Chapter 2.

4.3.3.1.2.1 Soils

Construction of the 1.7-acre drill pad would result in disturbance of approximately 2.5 acres of soil and would require a 28-foot cut and fill to accommodate the relatively small saddle with steepening slopes on all sides. Blasting of bedrock would likely be required at the drill site due to the shallow depth to bedrock; however, blasting should not be extensive due to the highly fractured and weathered nature of the surficial bedrock. Topsoil would be salvaged and selectively handled and stored away from construction activities. Cut slopes would be constructed to a 1:1 slope and fill slopes graded to a 1.5:1 slope. The bare soil would be left unprotected during the drilling phase. Increased erosion would occur on the bare soil; however, runoff and erosion control structures such as cutoff trenches, interception ditches, and diversion ditches would control surface runoff and erosion to minimal levels during the drilling phase.

If producible quantities of oil or gas were not encountered, the drill site would be recontoured to the approximate original contour and reclaimed. If producible quantities were encountered, the drill site would be

secured for a two- to three-year interim period while additional environmental analysis (i.e., environmental assessment and/or environmental impact statement) would be conducted and the FS and BLM reached a decision concerning well production and field development. During this time, all disturbed surfaces would be protected from surface runoff and erosion through the implementation of measures presented in Appendix D. Similarly, all runoff, drainage, and erosion control structures would be monitored and maintained in functional condition to minimize erosion and off-site sedimentation. The same measures and techniques, and therefore effectiveness of erosion control, would be used under either scenario including: 1) a dry-hole with full reclamation, or 2) the interim decision-making period in the event producible quantities of oil/gas were encountered.

The results of the USLE procedure indicated that increased erosion on the partially reclaimed drill site during the interim decision-making period in the event of production, or on the reclaimed drill site in the event of non-production, could be reduced to levels not considered significant. Unprotected surface soils would likely have an average erosion rate of approximately nine tons/acre/year. Assuming best management practices previously discussed, erosion would be reduced to one ton/acre/year after one year, representing an 88 percent reduction in erosion. After five years, erosion would decline to approximately 0.5 tons/acre/year due to complete revegetation, representing a 95 percent reduction. Significant erosion, therefore, is not expected to occur. Similarly, no impacts related to soil instability are anticipated since the drill site has a low stability hazard rating. Successful reclamation should be attainable although the relatively poor reclamation potential of the low fertility and high coarse fragment soils would require aggressive reclamation techniques to maintain soil productivity.

4.3.3.1.3 Alternative A Drill Site Variation

4.3.3.1.3.1 Geology

The discussion presented for the Alternative A access route also applies to the Alternative A Drill Site Variation.

The discussion presented for the Alternative A drill site also applies to the Alternative A Drill Site Variation. Based on currently available technical information of the size, location, and orientation of the target geologic structure, Phillips believes that this alternative would not provide them with the best opportunity of successfully reaching the target at the intended angle of approach as shown on Exhibit 2-6, and discussed in Section 2.2.2.6 and Appendix G.

4.3.3.1.3.2 Soils

The discussion presented above for Alternative A also applies to the Alternative A Drill Site Variation access road.

The discussion of soils presented for the Alternative A drill site also applies to the Alternative A Drill Site Variation, with a few exceptions. Construction of the 2.2 acre drill pad would disturb approximately 3.0 acres of soil including the drill pad, cut and fill slopes (0.6 acres), and topsoil stockpile (0.2 acres). Because this drill site is located on an alluvial bench comprised of relatively deep soils, blasting of bedrock will not be necessary during construction of the drill pad. Cut slopes would be constructed to a 1:1 slope and fill slopes graded to 1.5:1 slope. Topsoil would be salvaged and stockpiled away from the construction site. All disturbed surfaces would be protected from surface runoff and erosion through the implementation of measures presented in Appendix D. Unprotected surface soils would exhibit similar rates of erosion as those estimated for Alternative A by application of the USLE. Reclamation should be easier to attain for this alternative because new road construction will not be required over steep ground, and soils at the drill site have a slightly higher reclamation potential and more plentiful topsoil.

4.3.3.2 Alternative B - Gold Creek Site

4.3.3.2.1 Access Route

4.3.3.2.1.1 Geology

The discussion presented above for Alternative A also applies to the Alternative B access road.

4.3.3.2.1.2 Soils

The discussion presented under Alternative A applies to this alternative. Reconstruction of the 5.3 miles of the existing unimproved access road from the end of the county road to the abandoned Amoco drill site would cause similar impacts, including erosion estimations, as described under Alternative A.

From the abandoned Amoco drill site, new access road construction would partially follow an existing trail (0.5 miles) as well as traverse new terrain (0.4 miles). Impacts resulting from this construction would be similar to the new access road portion of Alternative A except for three points: Alternative B would not entail road construction across steep slopes; a short (100 feet) segment of Alternative B route just above the Forest boundary would encroach on a steep (70 percent) slope down to Gold Creek; and soils of the portion of the Alternative B access road from the Forest boundary to the drill site contain a high content of large boulders from one to over six feet in diameter. Fill material could fall down slope into Gold Creek where the access road encroaches on the creek, making successful control of erosion, revegetation, and maintenance difficult. The large boulders along this portion of the access route would require special handling during construction as well as during reclamation to minimize the loss of topsoil. Special handling would entail separating the large boulders from the topsoil. It is unlikely that road construction would encounter bedrock due to the anticipated great depth of ground moraine, alluvium, and colluvium; therefore, blasting is not expected to be necessary.

Erosion could be reduced to levels not considered significant along reconstructed roads as well as along the new segment of access road. Erosion estimates for unprotected disturbed soil were determined to be approximately three tons/acre/year. After one year with erosion control and revegetation, erosion would be reduced by 90 percent to 0.3 tons/acre/year and after five years erosion would be reduced by 96 percent or 0.1 tons/acre/year, assuming best management practices discussed previously. Problems due to slope instability are unlikely along this road segment since the soils have a low stability hazard. The high coarse fragment content could hamper selective topsoil salvage and handling. Maintaining sufficient quantities of topsoil would require special effort. With aggressive reclamation and erosion control, no significant impacts would likely occur. Successful reclamation should be attainable, although, the relatively poor reclamation potential of the low fertility and high coarse fragment soils would require aggressive reclamation techniques to maintain soil productivity.

4.3.3.2.2 Drill Site

4.3.3.2.2.1 Geology

The discussion presented for Alternative A applies to the Alternative B drill site. Based on currently available technical information and the interpretation of the size, location, and orientation of the target geologic structure, Phillips believes that the Gold Creek drill site would not provide the best opportunity of successfully reaching the target at the intended angle of approach as shown on Exhibit 2-6 and discussed in Section 2.2.3 of Chapter 2.

4.3.3.2.2.2 Soils

Construction of the 2.2-acre drill pad would result in disturbance of approximately *3.0* acres of soil, and would require a 29-foot cut and a 33-foot fill to accommodate the 25 percent gradient of the drill site. It is unlikely that drill site construction would encounter bedrock due to the anticipated great depth of ground moraine, alluvium, and colluvium; therefore, blasting is not expected to be necessary. Topsoil would be salvaged and selectively handled and stored away from construction activities. Similar to the access road, the large boulders that are common across the drill site would require special handling during drill pad construction and reclamation to minimize the loss of topsoil. Cut slopes would be constructed to a 1:1 slope, and fill slopes graded to a 1.5:1 slope. The bare soil would be left unprotected during the drilling phase. Increased erosion would occur on the bare soil; however, runoff and erosion control structures such as cutoff trenches, interception ditches, and diversion

ditches would control surface runoff and erosion to minimal levels during the drilling phase as discussed previously.

If producible quantities of oil or gas were not encountered, the drill site would be recontoured to the approximate original contour and reclaimed. Regraded cut and fill slopes would be retopsoiled, mulched, and revegetated. If producible quantities were encountered, the drill site would be secured from erosion during the two to three-year decision making period as previously discussed under Alternative A. Using the USLE to estimate erosion rates indicated that increased erosion on the partially reclaimed drill site in the event of production, or on the reclaimed drill site in the event of non-production, could be reduced to levels not considered significant. Unprotected surface soils would likely have an average erosion rate of approximately 10 tons/acre/year. Assuming best management practices as described previously, erosion would be reduced to one ton/acre/year after one year, representing a 90 percent reduction in erosion. After five years, erosion would be reduced to approximately 0.5 tons/acre/year due to complete revegetation, representing a 95 percent reduction. Therefore, significant erosion is not expected to occur. Similarly, no impacts related to soil instability are anticipated since the drill site has a low stability hazard rating. The high coarse fragment content could hamper selective topsoil salvage and handling. Special effort would need to be expended to maintain sufficient quantities of topsoil. Successful reclamation should be attainable although the relatively poor reclamation potential of the low fertility and high coarse fragment soils would require aggressive reclamation and erosion control techniques to maintain soil productivity. No significant impacts are likely to occur.

4.3.4 Impacts Summary

4.3.4.1 Access Routes

4.3.4.1.1 Geology

No significant impacts to the geologic environment or impacts on the project, including facilities due to geologic hazards are expected under both alternatives, *variation drill site* and access route variations.

4.3.4.1.2 Soils

Prime farmlands and farmlands of state and local importance would not be impacted since no construction would occur along Grove Creek Road. Reconstruction and use of the existing unimproved "two-track" roads from the end of the maintained Grove Creek Road to the Forest boundary would result in similar impacts for Alternative A, *Alternative A Drill Site Variation*, and Alternative B; however, Alternative A would involve approximately 1.3 miles of road in excess of Alternative B *and 0.7 miles of road in excess of the variation drill site*. Both access routes would involve soils with poor reclamation potential. With aggressive reclamation and erosion control, no significant impacts would likely occur under either alternative. Soil productivity could be maintained and erosion condition returned to that of predisturbance on revegetated cut and fill slopes. Utilization of either access route would not violate management direction mandated by the Custer National Forest LRMP (USDA-FS *1987b*). Increased erosion due to soil exposure and disturbance could be reduced to acceptable levels along both access routes with prompt revegetation and erosion and runoff control. Slope stability problems are not anticipated with either access route.

From the Forest boundary to Alternative A, *Alternative A Variation,* and Alternative B drill sites, each access route poses different impact potential. Alternative A would involve 0.3 miles of new road construction across virgin terrain. Alternative B would involve 0.9 miles across virgin terrain. *Alternative A Drill Site Variation would not require new road construction.* Alternative A would involve road construction across a 50 to 60 percent side slope that would require extensive cut and fill slopes, bedrock blasting, and increased maintenance requirements with standard construction techniques. In contrast, Alternative B would require road construction across soils with large boulders that would require special handling during construction and reclamation. Reclaiming the new portion of Alternative B would be more difficult than Alternative A due to the high content of large boulders. *Reclamation of access roads to the*

variation drill site would be the easier of the three potential drill sites. Although reclamation potential is poor, with the implementation of best management practices, reclamation of both access roads would be feasible. No significant impacts are anticipated along either access route on FS-administered land as discussed previously.

Since each access route variation crosses the same soil mapping units in approximately the same proportions, each route would involve the same soil erosion hazard and revegetation potential. Therefore, neither route would be environmentally preferred in this regard. Of the routing variations, Variation A3 would involve the least soil disturbance followed by Variations A2, A1, and A4.

4.3.4.2 Drill Sites

4.3.4.2.1 Geology

No significant impacts to the geologic environment or impacts on the project or facilities due to geologic hazards are expected under both alternatives *and the variation drill site.* Based on currently available information, Phillips believes that the Ruby Creek drill site would provide the best opportunity of successfully reaching the target at the intended angle of approach compared to the *Alternative A Drill Site Variation or the* Gold Creek site *as discussed in the following discussion, Section 2.2.2.6, and Appendix G.*

Analysis of the alternatives has indicated a significant number of disadvantages to drilling the well from another site other than the proposed Ruby A Federal No. 1-9 drill site. Because of the high complexity of the subsurface geology, the historical problems associated with drilling in the Cody Shale, and the topographical relief of the area, the proposed site remains the most favorable surface location available to drill the well except for the straight hole location on top of Line Creek Plateau. The proposed drill site would provide Phillips the best technical opportunity to access the target geologic structure in a manner that would allow structure characterization for possible production. Both the Gold Creek Site and the Alternative A Drill Site Variation are located far enough east of the target to pose serious drilling difficulties as described in the following section.

The major factors that greatly reduce the potential success of reaching the structure in a manner that would optimize structure characterization include the loss of vertical relief and the increased horizontal distance away from the objective. This is further demonstrated by comparing the probable results of drilling each drill site alternative using a 31 degree angle; the maximum directional angle necessary to drill the Ruby Creek site.

Ruby Creek Site (Alternative A): *The 31 degree angle well from this site allows for all seven primary and secondary objective formations to be intersected within 500 feet or less of the required target location. In this case, each formation of interest can be penetrated at or very close to the crest of the structure where the greatest potential for hydrocarbons exists.*

Gold Creek Site (Alternative B): *In the event a 31 degree angle well were to be drilled from this site, only the two deepest secondary objective formations could be penetrated within 800 feet of the target location. The primary objective formations would be intersected on the steep, down dipping, eastern flank of the structure, as much as 2,800 feet away from and 350 feet deeper than the required target. In this case, five of the seven potential objective formations cannot be reached at a reasonable location.*

Alternative A Drill Site Variation: *Similar results to the Gold Creek site would be obtained if a 31 degree angle well was drilled from this site. In this case, only the two deepest secondary objective formations could be intersected within 800 feet of the target location. The primary objective formations could, again, only be intersected on the eastern flank of the structure as much as 2,600 feet away from and 400 feet deeper than the required target.*

It must be noted that Phillips' present understanding of the geology of the target structure is based on seismic interpretations, surface geology, and other available well data. Exact depths of formations and other detailed

information cannot be determined until the well is drilled. Because of this, the well plan must remain within the technological limits available today. The current proposal, although difficult, provides the best opportunity in reaching the objectives.

Estimates of time required, risk, and additional expense have been projected below, comparing the proposed Ruby Creek site to the Alternative A Drill Site Variation located east of the Ruby Creek site. Alternative B, Gold Creek is also included here for purposes of comparison. This comparison is based on geologic characteristics and the directional angle required to reach the seven primary and secondary objective formations from each of the three drill site locations being considered.

Ruby Creek Site (Alternative A): *Drilling time is estimated at 150 days as previously stated in the EIS. Although this is the most technically feasible site to drill from, a 15 to 20 percent chance of failure to reach the objective formation exists. This is a result of the directional drilling requirements and geologic characteristics.*

Gold Creek Site (Alternative B): *Drilling time from this site is estimated at 195 days with an increased cost of $850,000 above those projected for the Ruby Creek site. The additional costs result from the increased rig and support costs combined with increased costs of directional services and anticipated corrections to the directional path. The chance of failure to reach the geologic objective is estimated at 60 to 70 percent. This increased risk is associated with the higher angle requirements of 47 degrees, increased exposure to problem shales, and sharper turns required to build and drop the angle.*

Alternative A Drill Site Variation: *Drilling time is estimated at 230 days with an estimated cost increase of $2,000,000. These costs again, are due to the additional rig and support costs and increased directional costs. The chance of failure to reach the objectives in this case is estimated at 80 to 90 percent, as the angle requirements of 51 degrees is considered to be at or near the technical drilling limits considering the geologic characteristics.*

The above time and cost estimates take into consideration slower drilling rates associated with the increased angle and minor drilling problems. Minor corrections to the angle and direction during the course of drilling were also considered and would, no doubt, be required. Additional factors such as sidetracks and major fishing operations were not considered in the increased cost and time. Should these factors be encountered, the increased time and costs would be higher than estimated above.

In order to minimize the risk, costs, and duration of the well, drilling operations could best be accomplished in the two-year split drilling season that exists because of wildlife and other resource considerations associated with the drilling proposal. Any unforeseen problems that may arise during drilling, which has a higher expectancy as the angle increases could cause the drilling time to extend into additional seasons.

4.3.4.2.2 Soils

Alternative A, *Alternative A Drill Site Variation* and *Alternative* B drill sites could be constructed and reclaimed without significant impact. Both *Alternative A and B* drill sites have poor reclamation potential; however, with aggressive reclamation and erosion control, no significant impacts would likely occur. *The Alternative A Drill Site Variation could be reclaimed more easily than Alternative A and B.* Soil productivity could be maintained and erosion condition returned to that of predisturbance. Utilization of either drill site would not violate management direction mandated by the Custer National Forest LRMP (USDA-FS *1987b*). Increased erosion due to soil exposure and disturbance could be reduced to acceptable levels (i.e., erosion condition) on *either* drill sites with prompt revegetation and erosion and runoff control. Slope stability problems are not anticipated with either drill site.

Alternative A drill site would likely require some bedrock blasting while construction of Alternative *A Drill Site Variation and Alternative* B drill sites would likely not require blasting. Alternative B drill site would involve a larger area of disturbance, slightly

greater cut and fill slopes, and large boulders that would require special handling during construction and reclamation in contrast with *both* Alternative A *and the Variation* drill sites. Alternative B drill site, therefore, would pose greater direct impacts to the soil environment than Alternative A *and the variation* drill sites although the increased level of impact would not be considered substantial.

4.3.5 Cumulative Impacts

4.3.5.1 Geology

No significant cumulative impacts are expected to occur to the geologic environment or to the project and facilities due to geologic hazard.

4.3.5.2 Soils

Existing land management activities that have impacted the soil environment to varying degrees within the project area primarily include grazing on non-Forest lands and road construction and use. In some areas grazing has been excessive resulting in soil compaction, vegetal cover removal, and subsequent increase in soil erosion. Road construction and use has caused an increase in soil erosion since a large portion of cut and fill slopes have not been protected from erosion with revegetation. Further, since most of the roads in the project area are unimproved, drainage and runoff control are sub-optimal. This adds to the increase in soil erosion over natural base rates. Overall, these impacts are not cumulatively significant and implementation of the proposed project would not significantly add to these impacts. Road improvement would likely reduce erosion levels with prompt revegetation of cut and fill slopes as well as the placement of optimal runoff and erosion control structures. Similarly, the abandoned Amoco drill site is adequately vegetated such that minimal erosion is occurring. Construction and reclamation of the drill sites would not add significantly to existing impacts. Therefore, no significant cumulative impacts are likely to occur due to implementation of the proposed project. Appendix B discusses impacts due to field development and suggests that no cumulative soils impacts would be expected.

4.3.6 Mitigation Summary

4.3.6.1 Geology

No mitigation would be required since significant impacts are not expected to occur to the geologic environment or to the project and facilities due to geologic hazard. To minimize the potential for destruction of significant paleontological remains, all finds should be brought to the attention of the FS or BLM to determine if mitigation is required.

4.3.6.2 Soils

The site-specific and prudently applied reclamation plan presented in Appendix D, combined with best management practices (FS Handbook 2509.22 and USDI-BLM and USDI-FS 1988), would greatly reduce adverse impacts to soils, including erosion losses. Interceptor ditches encompassing the drill pad draining/flowing into/through sediment traps would control erosion and prevent off-site sedimentation. All topsoil should be stripped from areas to be disturbed, stored, and reapplied to ensure a productive growth media for plants. Stored topsoil should be secured from erosion loss by mulching and/or temporary revegetation. Successful and timely revegetation of disturbed areas, including implementation of a fertilization program, would greatly reduce impacts to soils. Special road construction using best available engineering design and best construction techniques (i.e., benching, partial benching with fill, barriers or retaining walls, end hauling, etc.) and monitoring plans (i.e., quality control, etc.) could reduce the hazards of crossing the 50 to 60 percent slopes near the terminus of Alternative A access. Special handling of the large boulders that would be encountered along the terminus of Alternative B access road and drill site during construction and reclamation would promote successful reclamation. The portion of Alternative B access that encroaches Gold Creek could be rerouted away from the stream environment to avoid impacts to the creek.

4.3.7 Unavoidable Adverse Impacts

No unavoidable adverse impacts would occur to the geologic or soils environment under

either alternative assuming best management practices, successful implementation of Appendix D, and specific mitigation measures listed in Chapter 5.

4.4 WATER RESOURCES

4.4.1 Introduction

Impacts associated with drill pad and access road construction include the removal of vegetation, exposure of the soil surface, and compaction of the soil with resultant increases in overland flow and subsequent erosion and off-site sedimentation. These changes could create the potential for increased streamflow, increased stream sedimentation, and subsequent degradation of water quality below standards if they were not appropriately controlled or they occurred in close proximity to a stream. The magnitude and duration of these impacts depend on several factors, including slope aspect and slope gradient, degree and area of soil disturbance, susceptibility of soil to erosion, and proximity to established drainage channels. The duration of time within which construction activities take place and the timely implementation of and success or failure of mitigation measures applied would also be factors. These potential impacts would be greatest soon after the commencement of construction activities but would naturally decrease shortly after due to passive stabilization *(soil aggregation and armoring)* and implementation of erosion and sediment control measures.

Minor stream channel disruption could occur where access road construction or reconstruction crosses streams. Channel disruption could include alteration of channel configuration, gradient, or bed texture and subsequent changes in aggradation/degradation regime.

Water would be used during road and drill pad construction and would likely be obtained and trucked from authorized water sources in the project area. The quantity and rate of water withdrawal would be *minimized for a given water source so that no adverse impact would occur to existing water rights and downstream water use, including instream flows.* Appropriate state permits would be obtained *and stipulations and requirements would further minimize the potential for adversely impacting other water rights and uses.*

The leakage or spillage of the small quantity of fluids contained in the cuttings trench could degrade surface and groundwater. The potential of such an impact occurring would depend on the quantity released and proximity to the water body potentially impacted. However, the cuttings trench would be lined with a synthetic impermeable liner that *is designed to* preclude leakage. Reject and spent drilling fluids would be transported to an approved disposal site out of the project area. Spillage of petrochemicals associated with construction or operation of the project could also impact both surface and groundwater if released in close proximity to streams. Groundwater contamination could occur from well construction or operation due to the leakage of drilling fluids into groundwater or due to the mixing of groundwater of differing quality from different aquifers. Groundwater, oil, and gas may occur under high pressure that, upon being penetrated during well drilling, could migrate laterally along geologic strata or vertically along the outside of the well casing to areas of lower pressure. Contamination could reach surface water in areas at or below seeps, springs, or significant groundwater outflow.

To prevent these potential impacts from occurring, Phillips proposes to minimize all impacts to water resources through implementation of best management practices presented in several information sources including the USDA-FS Region 1 Soil and Water Conservation Handbook (FS Handbook 2509.22), the joint BLM and FS "Gold Book" or Surface Operating Standards for Oil and Gas Exploration and Development (USDI-BLM and USDA-FS 1988) *and requirements of Onshore Oil and Gas Order #2 (42 CFR 3160).* These information sources were used to prepare a site-specific erosion control, revegetation, and rehabilitation plan for the project. This plan is presented in Appendix D.

4.4.2 Impact Significance Criteria

The following criteria were used to determine the significance of impacts to water resources due to the proposed action or alternatives:

General:

- Implementation of the proposed action or alternatives would violate forest wide management direction and/or management area direction as described and mandated by the Custer National Forest LRMP and EIS (USDA-FS *1987b*) and the Billings Resource Area RMP (USDI-BLM 1983).

Surface Water:

- Degradation of water quality such that state and/or federal standards are not met.
- Modification of the quantity or quality of stream flows that affects established users such as humans, livestock, fish, and wildlife.
- Alteration of channel geometry or gradients producing undesirable effects such as aggradation, degradation, or side cutting.
- Location of permanent above-ground facilities within the 100-year floodplain of a stream.
- Downstream sedimentation that affects the operation of irrigation and domestic water control structures.

Groundwater:

- Degradation of groundwater quality of aquifers directly utilized through wells or that discharge into water bodies utilized for irrigation, domestic use, and wildlife and fisheries.
- Increase or decrease of water table levels caused by construction or operation of the proposed project.
- Interception of shallow water table resulting in slope instability.

4.4.3 Direct and Indirect Impacts

4.4.3.1 Alternative A - Proposed Action

4.4.3.1.1 Access Route

Impacts that would occur due to access road reconstruction and construction would be minimal. A slight increase in erosion and off-site sedimentation would occur due to reconstruction of existing two-track roads to the Forest boundary; however, the quantities would be minimal in the short-term and non-existent in the long-term.

Water for use during road construction would be obtained from a state-approved and permitted source. *Receipt of such a permit would entitle Phillips to withdraw and utilize the permitted amount of water.* It is likely that the necessary water would be obtained from the Clarks Fork. The rate and quantity of withdrawal would be minimized to avoid reducing flows in the river. The water would be trucked to the site of application. Upon termination of road construction, exposed soil would be quickly stabilized and protected, and efficient runoff and drainage control structures would be constructed along the permanent portion of the road as described in the Appendix D to minimize impacts to levels not considered significant. All drainage crossings would be designed and constructed to facilitate 50- to 100-year channel flows following standard engineering procedures. Most of the existing channel crossings would be upgraded to a more environmentally sound design. Approximately 1.2 miles of existing unimproved two-track road that parallels Ruby Creek would be reconstructed. This route is located above and out of the stream environment (i.e., 100-year flood plain). A relatively dense zone of vegetation (80 percent) 50- to 75-feet wide consisting primarily of sagebrush, grasses, and forbs occurs between the access route and the riparian zone and creek. This, combined with mild slope gradients (10 to 20 percent) oriented parallel to the stream rather than normal to the stream, and runoff and erosion control as specified in Appendix D would greatly minimize the potential of increased sedimentation of Ruby Creek. As indicated previously, road reconstruction would likely reduce the levels of erosion and sedimentation below that which is currently occurring from the unimproved two-track road through implementation of efficient runoff and erosion control structures.

Construction of 0.3 miles of new road to the drill site would similarly result in minimal

impact to water resources. Best management practices would minimize impacts, including efficient runoff and erosion control within the road environment, as described in Appendix D. There is sufficient upland vegetation between road construction and the stream such that when combined with runoff and erosion control, minimal increase in sedimentation of Ruby Creek would occur. Construction of the culverted stream crossing could cause a minor increase in sedimentation of Ruby Creek in the short-term; however, no long-term impacts of significance are anticipated since best management practices would be used to construct and place the culvert. Placement of a culvert would reduce channel disruption and increased sedimentation from the existing condition since the low water crossing would be eliminated. Successful reclamation of the new access road is feasible as discussed in the Soils and Vegetation Resources sections. If producible quantities of oil or gas were not encountered, the drill site would be abandoned and reclaimed, and the new access road from the Forest boundary to the drill site would be recontoured and reclaimed. If producible quantities were encountered, the cut and fill slopes of the new road would be secured for a two- to three-year interim period while additional environmental analysis (i.e., environmental assessment and/or environmental impact statement) were conducted and the FS and BLM reached a decision concerning well production and field development. The cut and fill surfaces of the road would be secured from erosion and surface runoff through mulching, netting, matting, and/or revegetation depending on site-specific conditions. Similarly, all runoff, drainage, and erosion control structures would be monitored and maintained in functional condition. No significant impacts due to erosion and sedimentation from the reclaimed road are anticipated since the site-specific, erosion control, revegetation and rehabilitation plan presented in Appendix D would be implemented.

During project construction and operation, there would be a small chance for spillage of oil or other products from trucks. The design and implementation of a chemical spill prevention and containment plan pursuant to Section 11.07 of the FS Handbook 2509.22 would greatly reduce impacts that could occur in the unlikely event of a spill.

Although minor adverse impacts to water resources would occur due to access road construction, operation, and reclamation, these impacts would not be considered significant relative to degradation of surface and groundwater, modification of surface water flow or groundwater levels, construction within a 100-year floodplain, downstream water control structures or water rights, or slope stability problems due to interception of shallow groundwater.

No significant impacts are anticipated to occur due to implementation of any of the Alternative A routing variations (Exhibit 3-2). The type and magnitude of impacts would be similar to those described previously for Phillips' proposed access. Since each variation would involve implementation of best management practices to minimize erosion to levels not considered significant, there would generally not be a substantial difference in the adverse impacts due to any of the variations. Implementation of Variation A2 or A3 could reduce the amount of existing erosion along improved roads by constructing more efficient and effective drainage control structures. Construction of a new bridge or reconstruction of the existing bridge over the Clarks Fork could temporarily impact the river through bank disturbance.

4.4.3.1.2 *Proposed* Drill Site

Construction of the drill site would not likely cause a significant increase in surface runoff and erosion since the implementation and correct placement of runoff and erosion control measures such as soil surface stabilization with mulches and revegetation, interception ditches, waterbars, berms, water turnouts, energy dissipators, and sediment traps would control surface runoff and minimize erosion to tolerable levels. These measures, combined with the 0.25-mile distance to Ruby Creek, would minimize the potential for contamination of the creek and subsequent reduction of water quality. No stream channels, drainage channels, floodplains, seeps, or springs would be impacted by construction and operation of the drill site.

Phillips proposes to use a closed mud system for well drilling. This system requires a substantially reduced storage capacity for drilling wastes and cuttings. The cuttings trench would be constructed in bedrock cut, which would provide more than adequate structural strength, thereby minimizing the potential of trench failure and subsequent spillage. Leakage of liquids would be possible; however, a properly installed synthetic liner would minimize the potential of leakage and subsequent contamination of groundwater or Ruby Creek. Trench overflow could potentially occur during or following drilling due to heavy rains or snowmelt. Over-design of the trench, or utilizing a maximum of 75 percent of its capacity for drilling wastes and the balance for direct precipitation and runoff, would minimize the potential for overflow. As indicated previously, the well would be cased with pressure tested steel pipe. The annulus, or void space between the outside of the casing and the drill hole, would be filled and sealed with cement. Upon well abandonment, the well casing would be left in place and plugged according to state and federal regulations. These measures would minimize the potential of contamination of groundwater or aquifers encountered during drilling. Hydraulic fracturing of deep geologic strata during well drilling is unlikely; however, this technique may be utilized for well testing purposes.

Phillips proposes to construct a water well on-site to supply water for the drilling program. Water requirements are expected to be relatively small *(1.3 acre-feet)* due to the reduced water requirements of a closed mud system. A groundwater appropriation permit would be required from the Montana Department of Natural Resources and Conservation for the groundwater used in conjunction with drilling activities. *Receipt of such a permit would entitle Phillips to withdraw and utilize the permitted amount of water.* The construction and use of such a well would not significantly impact groundwater quality or quantity or impact any nearby groundwater rights or claims. If groundwater was not encountered at the drill site, Phillips' next best option would entail drilling a shallow well along the access road on the alluvial bottomlands of Ruby Creek south and below the drill site (Exhibit 2-2). Water would be trucked to the drill site rather than moved by pumping and pipeline conveyance. The quantity and rate of withdrawal would be small compared to the quantity and rate of supply of groundwater in the alluvial aquifer. Since the groundwater would not be impacted, Ruby Creek would not likely be impacted by flow reduction. An additional possibility for a water source includes constructing a small impoundment on the headwaters of Ruby Creek in close proximity to the drill site. Ruby Creek flows at an approximate mean annual rate of less than 0.5 cfs in the vicinity of the drill site. The (1.3 acre-foot) water requirement would necessitate an impoundment of at least 0.5 acres in size depending on the timing and duration of water withdrawal. If such an impoundment were used, water would also be trucked to the drill site. This impoundment could adversely affect downstream water rights as well as in-stream uses by wildlife and aquatic insects by reducing streamflows *if the water was withdrawn over a short period of time.* In addition, construction of the impoundment would cause additional disturbance of the riparian zone and increased sedimentation of Ruby Creek.

Similarly as discussed for the access road, the design and implementation of a chemical spill prevention and containment plan pursuant to Section 11.07 of the FS Handbook 2509.22 would greatly reduce impacts that could occur in the unlikely event of a spill at the drill site.

Although adverse impacts to water resources would occur due to drill site construction, operation, and reclamation, these impacts would not be considered significant relative to degradation of surface and groundwater, modification of surface water flow or groundwater levels, construction within a 100-year floodplain, downstream water control structures or water rights, or slope stability problems due to interception of shallow groundwater.

4.4.3.1.3 Alternative A Drill Site Variation

Impacts to water resources that could occur from construction, operation, and reclamation of the Alternative A Drill Site Variation would

be similar to those discussed for Alternative A. The drill site is located approximately 400 feet from both forks of the Ruby Creek. The drill site is located out of the 100-year floodplain associated with both forks of Ruby Creek. Due to the close proximity of the drill pad to Ruby Creek, potential does exist for affecting the stream due to increased runoff, erosion and sedimentation, and spill of petroleum products and other pollutants. More stringent mitigation to minimize and control such potential impacts would be required. With implementation of these measures degradation of surface and groundwater, modification of surface water flow or groundwater levels, construction within a 100-year floodplain, downstream water control structures or water rights, or slope stability problems due to interception of shallow groundwater are not likely to occur.

4.4.3.2 Alternative B - Gold Creek Site

4.4.3.2.1 Access Route

Impacts that could occur due to access road reconstruction and construction would be minimal, and would be very similar to the impacts discussed for Alternative A. Water for use in road construction would be obtained from a state-approved and permitted source such as the Clarks Fork and trucked to the site of application. Water would be withdrawn at reduced rates to a reduction in streamflow. Road reconstruction would involve construction and placement of a culvert across Gold Creek. This route is located above and out of the stream environment (i.e., 100-year floodplain) except for a 100-foot segment that converges on steep slopes (70 percent) leading down to the creek where an increase in sedimentation could occur. Relocation of the road away from the stream environment and implementation of best management practices would minimize increased sedimentation of the stream. Except for this segment, the relatively dense zone of vegetation (80 percent) 50 to 75 feet wide that occurs between the access route and the riparian zone and creek, combined with mild slope gradients (10 to 20 percent) oriented parallel to the stream rather than normal to the stream, and runoff and erosion control, would minimize the potential of increased sedimentation of Gold Creek.

As indicated previously, road reconstruction would likely reduce the levels of erosion and sedimentation below that which is currently occurring from the unimproved two-track road through implementation of efficient runoff and erosion control structures.

Impacts associated with the construction, operation, and reclamation of the new access road from the abandoned Amoco drill site to the Alternative B drill site would be very similar to those described for Alternative A. Although minor adverse impacts to water resources would occur due to access road construction, operation, and reclamation, these impacts would not be considered significant relative to degradation of surface and groundwater, modification of surface water flow or groundwater levels, construction within a 100-year floodplain, downstream water control structures or water rights, or slope stability problems due to interception of shallow groundwater.

4.4.3.2.2 Drill Site

Impacts to water resources that could occur due to construction, operation, and reclamation of the drill site would be very similar to those discussed for Alternative A. The drill site is located approximately 0.2 miles from Gold Creek; therefore, there is minimal chance for affecting the stream. Although minimal adverse impacts to water resources would occur due to drill site construction, operation, and reclamation, these impacts would not be considered significant relative to degradation of surface and groundwater, modification of surface water flow or groundwater levels, construction within a 100-year floodplain, downstream water control structures or water rights, or slope stability problems due to interception of shallow groundwater. The discussion on alternative water sources to a water well drilled on-site presented under Alternative A also applies to this alternative. In this case, if groundwater was not encountered at the drill site, Phillips' would construct a water well below the drill site in closer proximity to Gold Creek. The discussion on impacts presented under Alternative A applies to Alternative B. Water would be trucked to the drill site. A groundwater appropriation permit would be obtained from the Montana Department of

Natural Resources. A possibility exists *for* constructing a small impoundment on Gold Creek near the drill site. Such action could significantly impact the creek.

4.4.4 Impacts Summary

No significant impacts would occur to water resources due to implementation of Alternative A, *Alternative A Drill Site Variation,* or Alternative B relative to degradation of surface and groundwater, modification of surface water flow or groundwater levels, construction within a 100-year floodplain, downstream water control structures or water rights, or slope stability problems due to interception of shallow groundwater. *Due to the closer proximity of the Alternative A Drill Site Variation to Ruby Creek, the potential for and risk of adversely impacting Ruby Creek would be slightly higher than for the proposed drill site or Alternative B drill site.* Placement of a water well on the drill site would be preferable to constructing a well off-site or by constructing an impoundment on Ruby Creek or Gold Creek. Increased sedimentation of Gold Creek could occur where reconstruction of the existing road above the abandoned Amoco drill site converges on the stream environment. These potential impacts could be easily avoided by relocating the road 50 to 75 feet north of its present location. Based on the total amount of road reconstruction and new road construction in proximity to a stream, implementation of Alternative B would pose greater potential for impacting water resources than Alternative A. This differential would not be considered significant assuming minor relocation of the Alternative B access road away from Gold Creek. Implementation of either Alternative A, *Variation drill site,* or Alternative B would not violate existing management direction as itemized in the Custer National Forest LRMP and EIS (USDA-FS *1987b*).

Since no anticipated game fisheries occur in Ruby and Gold creeks and since there is no surface water communication between the Clarks Fork and these streams, fishery resources would not likely be impacted. Neither alternative is likely to adversely impact fishery resources of the Clarks Fork.

4.4.5 Cumulative Impacts

Existing land and resource management activities within the project area primarily include grazing on non-Forest lands and road construction and use. These activities and uses have not substantially affected the water resources in the project area. Road construction and use has caused an increase in soil erosion since a portion of cut and fill slopes have not been protected from erosion with revegetation. Further, since most of the roads in the project area are unimproved, drainage and runoff control are sub-optimal, which adds to the increase in soil erosion over natural base rates. Overall, these impacts are not cumulatively significant. Implementation of the proposed project would likely decrease erosion and sedimentation from roads since drainage and runoff control would be improved; therefore implementation of the proposed project would not significantly add to these impacts. Appendix B discusses impacts due to field development and suggests that no significant cumulative impacts to water resources would be expected.

4.4.6 Mitigation Summary

Impacts to water resources could be reduced by minimizing the area of disturbance to that absolutely necessary for construction, operation, and reclamation of the drill site and access road. This is particularly important in close proximity to stream environments. Implementation of the detailed site-specific erosion control, revegetation, and rehabilitation plan (Appendix D) would reduce surface runoff, erosion, and off-site sedimentation from all disturbed areas. The plan includes the use of interception ditches, sediment traps, water bars, silt fences, as well as revegetation and soil stabilization techniques to minimize impacts. Specifically for the drill site, an interception ditch would be constructed along the top of all cutslopes to preclude surface water from entering the drill pad area as well as a berm surrounding the pad along all fill areas to preclude runoff. These structures would be inspected periodically for integrity and efficient operation. The plan includes annual monitoring and identification/implementation of remedial measures if determined to be

necessary. *In addition, a water quality monitoring plan would be designed and implemented as described in Chapter 5.*

State-of-the-art well casing and cementing technology would minimize contamination of groundwater during well drilling and well operation. This technology includes casing the well during drilling and cementing the annulus between the casing and wellbore. The cuttings trench should be designed such that only 75 percent of total capacity is utilized, leaving the balance as a buffer to hold direct precipitation and runoff. A synthetic membrane liner of sufficient thickness to minimize puncture or fatigue should be placed within the trench to minimize the potential of leakage.

All water withdrawal (i.e., surface water and groundwater) and use should comply with state law. This includes obtaining instream diversion rights and groundwater allocation permits. The quantity and rate of water withdrawal should be minimized to reduce the potential of depleting the groundwater resource and/or reducing in-stream flows. The design and timely implementation of a chemical spill prevention and containment plan pursuant to Section 11.07 of FS Handbook 2507.22 would greatly reduce impacts that could occur in the unlikely event of a spill at the drill site or along the access road.

If Alternative B is implemented, the access route in close proximity to Gold Creek should be relocated approximately 50 to 75 feet north of the existing trail to avoid the potential of increasing sedimentation of the creek.

4.4.7 Unavoidable Adverse Impacts

With implementation of the mitigation measures summarized above, the specific mitigation items presented in Chapter 5; and the measures presented in Appendix D, no unavoidable adverse impacts would occur to water resources under either alternative.

4.5 VEGETATION, TIMBER, AND RANGE RESOURCES

4.5.1 Introduction

Clearing vegetation and disturbing soils during construction of the access road and drill site would directly impact general vegetation and related resources. Except for riparian cottonwood and willow scrub, a reduction in the areal cover of vegetation community types affected would be a negligible impact since these communities are common, have wide distribution, and occur with high frequency within the general project area. Disturbances to wetlands could require administrative coordination with the Department of Army Corps of Engineers (COE) pursuant to the federal Clean Water Act. Section 404 permit(s) could be required. The COE, based on the exact nature of the disturbance activity and site-specific conditions, would determine the type of permit (Individual, Regional, or Nation Wide) required according to the rules and regulations presented in the Federal Register (1986).

The duration of impacts depends on the time required for natural succession to return revegetated areas to predisturbance conditions. Vegetation cover types within the project area primarily have poor to fair revegetation potentials, with some small isolated areas having a good potential as itemized in the Soils Section of Chapter 3 and 4. Revegetation could stabilize most disturbances within one or two years. Construction activities could introduce undesirable and noxious weed species into an otherwise weed-free area. These weeds often out-compete the more desirable species, rendering the site less productive as a source of forage for livestock and wildlife. Sites dominated by weeds often take on a different visual character that may be in visual contrast with surrounding undisturbed vegetation.

Construction and operation of the proposed project would not directly or indirectly affect the quality or integrity of the proposed Meeteetse Spires Preserve since road construction activities are not proposed within the proposed preserve area.

Construction of this project could result in a reduction in livestock and wildlife forage and a subsequent reduction of animal unit months (AUMs) in the Grove Creek Allotment. See the Vegetation Section of Chapter 3 for a

description of the Grove Creek Allotment. For the purposes of assessing impacts to range resources, acres of disturbance were converted to reduction in AUMs based on an average of five acres per AUM for the Grove Creek Allotment. USDI-BLM (1983) indicates an average of seven acres per AUM on the allotment.

4.5.2 Impact Significance Criteria

The following criteria were used to determine the significance of impacts to vegetation resources due to the proposed action or alternatives:

General:

- Implementation of the proposed action or alternatives would violate management direction and/or management area direction as described and mandated by the Custer National Forest LRMP and EIS (USDA-FS 1987b) and the Billings BLM Resource Area RMP (USDI-BLM 1983).

General Vegetation:

- Following reclamation, areas not having an adequate cover of vegetation within five years to stabilize the site to predisturbance erosion conditions or the species composition to support pre-existing land use including grazing, wildlife habitat, recreation, and agricultural operations. The following performance standards were used to determine whether revegetation has been successfully attained:

  1) Percent Cover: 75 percent of the total vegetal cover measured for the reference transect (i.e., baseline conditions).

  2) Dominant Species: 90 percent of the revegetation consists of species contained in the applied seed mix and/or that occur in the reference transect.

  3) Seedling Density: The density and abundance of seedlings is at least three to four seedlings per linear foot.

  4) Grazing Utilization: The grazing utilization rating is not worse than moderate.

- Discharge of dredge or fill into wetland areas (as determined using the Department of Army Corps of Engineer's wetlands delineation manual) and/or the reduction of wetland area in the project area that lasts in the long-term.

- Introduction and establishment of noxious and undesirable weedy plant species precluding successful revegetation with desirable species within five years.

Plant Species of Special Concern:

- Reduction in numbers of individuals of plant species of special concern or disturbance of suitable habitat judged important to the survival of those species. These species include federally listed threatened and endangered species, federal candidate species for listing (candidate 1 and/or 2 species), or species considered rare or important by the Montana Heritage Inventory Program.

Timber Resources:

- Removal of commercially valuable timber or stands where timber stand improvements have been implemented, where monetary reimbursement for the loss of timber and improvement investments would not substantially compensate for the loss.

Range Resources:

- Reduction in AUMs on any grazing allotment by five percent or more.

- Disruption of critical ranching operations such as calving, livestock trailing, maintenance of control or separation of livestock, maintenance of stock watering sources, and the ability to use the range in a normal manner.

- Death of range livestock due to vehicle/animal contact associated with project activities.

4.5.3 Direct and Indirect Impacts

4.5.3.1 Alternative A - Proposed Action

4.5.3.1.1 Access Route

Reconstruction of unimproved two-track roads from the county road to the terminus of the existing two-track road would involve clearing an average of ten feet on each side of the existing road surface. Over the 8.8 miles of access route, this clearing would represent approximately 20.6 acres within the sagebrush scrub vegetation cover type and 0.7 acres in the limber pine woodland cover type. Approximately 0.3 miles of new road construction to the drill site would involve clearing a 40-foot-wide construction right-of-way (ROW) through limber pine woodland. This would result in clearing approximately 1.5 acres of limber pine woodland. The reduction of these cover types due to clearing would not be significant since these types cover vast areas within the region. Although revegetation potential is poor to fair for the areas that would be disturbed, successful revegetation is attainable and would require aggressive reclamation and erosion control techniques. A site-specific erosion control, revegetation, and rehabilitation plan for the project is presented in Appendix D.

The road would also cross the 30-foot-wide riparian zone associated with Ruby Creek and would require clearing approximately 0.02 acres of riparian cottonwood and willow scrub at the same point at which the existing unimproved trail crosses the creek. The existing trail crosses the riparian zone with a low water crossing. Although this wetland type is protected by the Clean Water Act and is relatively rare in the region, the loss of 0.02 acres would not be considered significant or in violation of Management Area M directives since an existing trail already has disturbed the wetland at this point, and there would not be a significant reduction in the functional values provided by this wetland. Placement of a sufficiently sized culvert and minimization of the amount of riparian zone affected would minimize impacts to levels not considered significant.

As with any development, construction and increased activity associated with this project could introduce noxious weeds into an otherwise weed-free area. Such an invasion would be considered significant. Monitoring for noxious weed invasion along the access road and immediate control would preclude the occurrence of this significant impact. The FS would be responsible to ensure that Phillips monitors for noxious weeds and, if necessary, designs and implements eradication measures. Monitoring and eradication of noxious weeds would be a requirement of the reclamation bonding process.

A field survey for the plants listed in Table 3-4 was accomplished in July, 1989 along the access route variations to the proposed drill site (Grah and Smith 1989). Only one of the species itemized in Table 3-4, bird's foot sagebrush, was found in the immediate vicinity of the access route variations. Several populations of bird's foot sagebrush were located along the margin of the existing roads from near the terminus of the Grove Creek Road south to the Meeteetse Trail (Variations A1 and A2), south along the Meeteetse Trail (Variation A2) to the Robertson Draw Road, and west along the Robertson Draw Road (Variation A3). Road reconstruction along Variation A1 would destroy some plants and approximately 0.2 acres of habitat. Road reconstruction along Access Variation A2 and A3 would destroy plants in at least six separate populations for a total of approximately 1.5 acres. No populations of bird's foot sagebrush were located along Variation A4 and, therefore, the species is unlikely to be impacted by Variation A4.

The 21.3 acres of vegetation clearing along the existing unimproved two-track roads within the Grove Creek allotment would cause a reduction of approximately 4.3 AUMs, or 0.3 percent of the total AUMs contained on the 23,507-acre allotment. This reduction in AUMs would not be significant according to the significance criteria previously listed. Similarly, the vegetation clearing on Forest land associated with new road construction would not significantly reduce the amount of forage available to wildlife.

No significant impacts are anticipated to occur due to implementation of any of the Alternative A routing variations (Exhibit 3-2). The type and magnitude of impacts would be

similar to those described previously for Phillips' proposed access. The area of disturbance of each vegetation cover type is presented in Table 4-2. The difference in disturbance between each variation (A3 - 15.5 acres, A2 - 18.0 acres, A1 - 22.8 acres, and A4 - 23.8 acres) would not be considered substantial in regard to the impacts discussed for Phillips' proposed access route. Variation A3 could impact the riparian zone of the Clarks Fork during bridge reconstruction or new bridge construction.

4.5.3.1.2 *Proposed* Drill Site

Construction of the 1.7-acre drill site would require clearing approximately 2.5 acres of limber pine woodland consisting mostly of grass, forbs, shrubs, and some scattered limber pine. The loss of this cover type and wildlife forage provided by this type would not be considered significant. In addition to vegetation clearing during construction, it is possible that additional vegetation in the immediate vicinity of the drill site could be adversely affected (defoliation and/or browning) or destroyed due to emission of H_2S during drilling and/or well testing, or due to emission of SO_2 during flaring. If such adverse impacts occurred, the area of impact would need to be revegetated. Revegetation could include reducing the acidity levels of the soil if found to be excessive by applying appropriate quantities of lime.

Although the drill site has a poor reclamation potential, successful revegetation is attainable with the aggressive reclamation and erosion control techniques listed in Appendix D. If producible quantities of oil or gas are not encountered, the drill site would be recontoured to the approximate original contour and reclaimed. Regraded cut and fill slopes would be retopsoiled, mulched, and revegetated per Appendix D. If producible quantities were encountered the drill site would be secured for a two- to three-year interim period while additional environmental analysis (i.e., environmental assessment and/or environmental impact statement) were conducted and the FS and BLM reached a decision concerning well production and field development. During this time, all disturbed surfaces would be protected from surface runoff and erosion through the use of mulching, netting, matting, and/or revegetation depending on site-specific conditions. These measures are discussed in detail in the site-specific erosion control, revegetation, and rehabilitation plan presented in Appendix D. The same measures and techniques and therefore effectiveness of erosion control would be used under either scenario including dry-hole with full reclamation or the interim decision making period in the event producible quantities of oil/gas are encountered.

No wetlands would be impacted due to the construction and operation of the drill site. Noxious weeds could invade the site as previously discussed; however, with the close monitoring of weed invasion and immediate eradication, no significant impacts would likely occur. *A field survey for the plants listed in Table 3-4 was accomplished in July, 1989 at the proposed drill site (Grah and Smith 1989). None of the species itemized in Table 3-4 were identified at the drill site. Several ninebark (Physocarpus) bushes were identified near the proposed drill site. These specimens exhibited morphologic characteristics of both the common species (Physocarpus malvaceous) and the rare species (Physocarpus monogynus). Close examination of both morphology, growth habit, and habitat indicated a strong tendency toward the more common species. Therefore, no plant species of concern would be impacted due to construction of the proposed drill site.* Construction, operation, and abandonment of the drill site would not impact grazing or timber management for reasons discussed previously.

4.5.3.1.3 Alternative A Drill Site Variation

Impacts to vegetation, timber, and range resources resulting from access to the Alternative A Drill site Variation would be very similar to those described under Alternative A except that the need to clear approximately 1.5 acres of limber pine woodland (required to construct 0.3 miles of new road on Forest land) and 1.0 acres of sagebrush scrub (reconstruction of 0.4 miles of existing unimproved road) to access the Alternative A drill site would not be required.

Construction of the 2.2 acre drill site and 0.8 acres of cut and fill slope and topsoil stockpile

would require clearing sagebrush scrub vegetation community type consisting mostly of shrubs, grasses, and forbs. These and associated impacts would not be considered significant for the same reasons discussed under Alternative A. Also as discussed under alternative A, no impacts to plant species of concern would occur due to drill site construction; however, the same potential impact would occur to bird's foot sagebrush along the lower portion of the access road as discussed under Alternative A.

4.5.3.2 Alternative B - Gold Creek Site

4.5.3.2.1 Access Route

Implementation of this access road alternative would be very similar to that described under Alternative A. Approximately 10.2 acres of sagebrush scrub and 2.7 acres of limber pine woodland would be cleared due to reconstruction of the existing unimproved two-track roads from the improved county road to the abandoned Amoco drill site. This clearing would represent a loss of 2.6 AUMs, representing approximately 0.2 percent of the total AUMs on the Grove Creek Allotment. This impact would not be considered significant. From the abandoned Amoco drill site to this alternative drill site, approximately 0.9 miles of new access road would be constructed through limber pine woodland representing approximately 4.4 acres of clearing. In addition, approximately 0.03 acres of riparian zone associated with Gold Creek could be impacted due to road crossing and encroachment. These and associated impacts would not be considered significant for the same reasons as discussed under Alternative A. *No plant species of concern were identified along this access route, and therefore, no impacts to these species would occur. The more common species of ninebark was identified along the upper portion of the access route. Therefore, Physocarpus monogynous would not be impacted by road construction and reconstruction.*

4.5.3.2.2 Drill Site

Implementation of this alternative drill site would be very similar to that described under Alternative A. Construction of the 2.2-acre drill site would result in clearing approximately 3.0 acres of limber pine woodland. These and associated impacts would not be considered significant for the same reasons as discussed under Alternative A. *No plant species of concern were identified at this drill site, and therefore, no impacts to these species would occur. The more common species of ninebark was identified at the drill site. Therefore, Physocarpus monogynous would not be impacted by drill site construction.*

4.5.4 Impact Summary

4.5.4.1 Access Routes

Impacts that would occur with implementation of either alternative would be very similar. None of the impacts would be considered significant. Alternative A access would involve 5.5 acres of vegetation clearing in excess of Alternative B. Both alternatives would involve impacts to wetlands; however, Alternative A access would directly impact the riparian zone of Ruby Creek due to crossing while Alternative B would directly impact the riparian zone associated with Gold Creek due to crossing and potential encroachment. Impacts due to noxious weed invasion, potential impacts to species of special concern, and impacts to range and timber management would be the same for each alternative. Neither alternative would likely affect critical ranching operations. Reimbursement of ranchers for accidental death of livestock in the Grove Creek Allotment due to project-related vehicle collision would be a condition of the access road right-of-way permit or per agreement with private land owners. Successful reclamation and revegetation would be feasible for both alternatives; however, the high content of large boulders along the new road portion of Alternative B could hamper reclamation success as discussed in the Soils Section of this chapter. Table 4-2 summarizes the cumulative areas of disturbance within the various vegetation cover types associated with each access alternative and access route variations. *Access to the Alternative A Drill Site Variation would involve 1.5 and 1.0 acres less clearing in limber pine woodland and sagebrush scrub, respectively, than for accessing the proposed drill site under either access route variation.*

Table 4-2. Disturbance[a] to Vegetation Cover Types Due to Road Construction and Reconstruction and Drill Pad Construction under Alternative A and Access Route Variations and under Alternative B.

ACTIVITY	Vegetation Cover Types[b] SS (mi)	SS (ac)	LP (mi)	LP (ac)	MC (mi)	MC (ac)	AF (mi)	AF (ac)	RI[c] (mi)	RI[c] (ac)	TOTAL Distance (mi)	TOTAL Area (ac)
ALTERNATIVE A												
Variation A1												
Road Reconstruction	8.5	20.6	0.3	0.7	0.0	0.0	0.0	0.0	<0.0>	<0.02>	8.8	21.3
New Road Construction	0.0	0.0	0.3	1.5	0.0	0.0	0.0	0.0	<0.0>	<0.00>	0.3	1.5
Subtotal	8.5	20.6	0.6	2.2	0.0	0.0	0.0	0.0	<0.0>	<0.02>	9.1	22.8
Drill Site	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	<0.0>	<0.00>	0.0	2.5
TOTAL	**8.5**	**20.6**	**0.6**	**4.7**	**0.0**	**0.0**	**0.0**	**0.0**	**<0.0>**	**<0.02>**	**9.1**	**25.3**
Variation A2												
Road Reconstruction	6.5	15.8	0.3	0.7	0.0	0.0	0.0	0.0	<0.0>	<0.02>	6.8	16.5
New Road Construction	0.0	0.0	0.3	1.5	0.0	0.0	0.0	0.0	<0.0>	<0.00>	0.3	1.5
Subtotal	6.5	15.8	0.6	2.2	0.0	0.0	0.0	0.0	<0.0>	<0.02>	7.1	18.0
Drill Site	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	<0.0>	<0.00>	0.0	2.5
TOTAL	**6.5**	**15.8**	**0.6**	**4.7**	**0.0**	**0.0**	**0.0**	**0.0**	**<0.0>**	**<0.02>**	**7.1**	**20.5**
Variation A3												
Road Reconstruction	5.5	13.3	0.3	0.7	0.0	0.0	0.0	0.0	<0.0>	<0.02>	5.8	14.0
New Road Construction	0.0	0.0	0.3	1.5	0.0	0.0	0.0	0.0	<0.0>	<0.00>	0.3	1.5
Subtotal	5.5	13.3	0.6	2.2	0.0	0.0	0.0	0.0	<0.0>	<0.02>	6.1	15.5
Drill Site	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	<0.0>	<0.00>	0.0	2.5
TOTAL	**5.5**	**13.3**	**0.6**	**4.7**	**0.0**	**0.0**	**0.0**	**0.0**	**<0.0>**	**<0.02>**	**6.1**	**18.0**
Variation A4												
Road Reconstruction	8.9	21.6	0.3	0.7	0.0	0.0	0.0	0.0	<0.0>	<0.02>	9.2	22.3
New Road Construction	0.0	0.0	0.3	1.5	0.0	0.0	0.0	0.0	<0.0>	<0.00>	0.3	1.5
Subtotal	8.9	21.6	0.6	2.2	0.0	0.0	0.0	0.0	<0.0>	<0.02>	9.5	23.8
Drill Site	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	<0.0>	<0.00>	0.0	2.5
TOTAL	**8.9**	**21.6**	**0.6**	**4.7**	**0.0**	**0.0**	**0.0**	**0.0**	**<0.0>**	**<0.02>**	**9.5**	**26.3**

Table 4-2. Continued.

ACTIVITY	Vegetation Cover Types[b] SS (mi)	SS (ac)	LP (mi)	LP (ac)	MC (mi)	MC (ac)	AF (mi)	AF (ac)	RI[c] (mi)	RI[c] (ac)	TOTAL Distance (mi)	TOTAL Area (ac)
ALTERNATIVE A CONT.												
Variation Drill Site[d]												
Road Reconstruction	8.4	20.4	0.0	0.0	0.0	0.0	0.0	0.0	<0.0>	<0.02>	8.4	20.4
New Road Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	<0.0>	<0.00>	0.0	0.0
Subtotal	8.4	20.4	0.0	0.0	0.0	0.0	0.0	0.0	<0.0>	<0.02>	8.4	20.4
Drill Site	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	<0.0>	<0.02>	0.0	3.0
TOTAL	**8.4**	**23.4**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**<0.0>**	**<0.02**	**8.4**	**23.4**
ALTERNATIVE B												
Road Reconstruction	4.2	10.2	1.1	2.7	0.0	0.0	0.0	0.0	<0.0>	<0.03>	5.3	12.9
New Road Construction	0.0	0.0	0.9	4.4	0.0	0.0	0.0	0.0	<0.0>	<0.00>	0.9	4.4
Subtotal	4.2	10.2	2.0	7.1	0.0	0.0	0.0	0.0	<0.0>	<0.03>	6.2	17.3
Drill Site	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	<0.0>	<0.00>	0.0	3.0
TOTAL	**4.2**	**10.2**	**2.0**	**10.1**	**0.0**	**0.0**	**0.0**	**0.0**	**<0.0>**	**<0.03>**	**6.2**	**20.3**

a - A 20-foot-wide construction zone assumed for reconstruction of existing unimproved roads; a 40-foot-wide construction zone assumed for construction of new road.
b - SS=sagebrush scrub; LP=limber pine woodland; MC=mixed conifer; AF=alpine bunchgrass and forbland; and RI=riparian cottonwood and willow scrub.
c - Disturbance within riparian zone is less than 0.1 acre. This magnitude cannot be resolved for the other vegetation cover types.
d - Reduction in miles and acres of clearing from Alternative A Access Route Variations.

The proposed Meeteetse Spires Preserve would not be directly or indirectly impacted by either alternative. Neither of the access routes would violate current management direction as man-dated by the Custer National Forest LRMP and EIS (USDA-FS *1987b*) and the Billings Resource Area RMP (USDI-BLM 1983).

4.5.4.2 Drill Sites

Impacts that would occur with implementation of either *of the drill sites* would be very similar. None of the impacts would be considered significant. Alternative B drill site would involve 0.5 acres of vegetation clearing in excess of Alternative A. Impacts due to noxious weed invasion, and potential impacts to species of special concern would be the same for each alternative and access route variation. Successful reclamation and revegetation would be feasible for *each drill site*; however, the high content of large boulders at the Alternative B drill site could hamper reclamation success as discussed in the Soils Section of this Chapter. *The Alternative A Drill Site Variation would be the easiest to fully reclaim.* Table 4-2 summarizes the cumulative areas of disturbance within the various vegetation cover types associated with each drill site alternative. Neither of the drill sites would violate existing management direction as mandated by the Custer National Forest LRMP (USDA-FS *1987b*).

4.5.5 Cumulative Impacts

Existing land management activities that have impacted the vegetation of the project area to varying degrees primarily include grazing on non-Forest lands, road construction and use, and the abandoned Amoco drill site. In some areas grazing has been excessive, resulting in soil compaction, vegetal cover removal, and subsequent increase in soil erosion. The abandoned drill site has naturally stabilized and become covered by the invasion of native species. Overall, these impacts are not cumulatively significant and implementation of the proposed project would not significantly add to these impacts. Appendix B discusses impacts due to field development and suggests that no significant cumulative impacts to vegetation would be expected.

4.5.6 Mitigation Summary

Adverse impacts to vegetation and associated resources could be greatly reduced or avoided by revegetating all disturbed areas as soon as possible after construction through implementation of a site-specific revegetation, erosion control, and rehabilitation plan as itemized in Appendix D. Road construction should avoid wetland areas. If avoidance is not possible, the area of disturbance should be minimized. Only certified weed-free mulch should be used for erosion control and revegetation purposes. A monitoring program should be designed and implemented to detect noxious weed invasion as a condition of the reclamation bonding process. If an invasion is detected, eradication measures as described in the Custer National Forest Noxious Weed Implementation Plan EIS (USDA-FS 1986b) should be implemented immediately. Prior to road construction, all areas to be disturbed should be staked and surveyed for plant species of concern conducted during the growing and/or flowering seasons. If any of the species itemized in Table 3-4 were found, the feasibility of re-routing or relocating areas that would be disturbed should be determined. All range improvement structures such as fences, cattleguards, and water developments should be left in functional condition so as to ensure current allotment management operations could continue.

4.5.7 Unavoidable Adverse Impacts

No unavoidable adverse impacts would occur under either alternative, assuming best management practices and specific mitigation measures listed in Appendix D are successfully implemented.

4.6 WILDLIFE

4.6.1 Introduction

The principle impacts likely to be associated with the proposed access routes and drilling operations include: 1) the displacement of some wildlife species, 2) the loss of wildlife habitat, and 3) an increase in the potential for collisions between wildlife and motor vehicles.

4.6.2 Impact Significance Criteria

The following criteria were used to determine the significance of impacts to wildlife due to the proposed action or alternatives:

- Impacts to general major interest wildlife species, including important game species, would be considered significant if any of the following were to occur:

  1. Project-related activities impact an officially-designated crucial habitat during an important use period.

  2. Short-term direct mortality (road kills, poaching, harassment, etc.) exceeds existing levels by ten percent.

  3. A permanent reduction in population recruitment rate occurs as the result of project activities.

  4. Disruption of grouse or raptor breeding or nesting activities.

  5. The area of disturbance within a riparian habitat exceeded one percent of the total acreage of riparian habitats within the lease area.

- Impacts to species of special concern such as federally listed threatened or endangered species, species proposed for listing, FS or state sensitive species and federal candidate species would be considered significant if the following were to occur:

  1. The loss (death) of any individual from direct or indirect project-related causes, including but not limited to recruitment rate reductions to viable population.

  2. A "may affect" determination was reached by the FS in the Biological Assessment (Evaluation) required by Section 7 of the Endangered Species Act of 1973 (as amended).

  3. Project-related impacts would jeopardize or substantially decelerate the recovery program for any species.

4.6.3 Direct and Indirect Impacts

4.6.3.1 Alternative A - Proposed Action

4.6.3.1.1 Access Route

Potential impacts to wildlife species are analyzed separately for each of the four access road segments previously described under the Affected Environment chapter. Access road segments are numbered in chronological order proceeding from Montana State Highway 72 and progressing westward to the drill site (Exhibits 3-6 and 3-7).

Segment 1:

Considerations involved on Segment 1 include assessments of the potential for vehicular collisions with mule deer, sage grouse, Hungarian and chukar partridge, cottontail rabbits, skunks, raccoons, rodents, mountain plover, long-billed curlews, Swainson's hawk, bald and golden eagles, white-tailed prairie dogs, black-footed ferrets, and general wildlife.

Since no improvements to this road segment are proposed, no loss of wildlife habitats would occur. The principle potential impact of project-associated activities is an increase in the potential for vehicle-wildlife collisions, particularly for young birds and animals, birds that use the road as a source of grit or gravel, and slow-moving, inconspicuous, and nocturnal species such as skunks and rodents. Unless appropriate precautions are taken, an increase in vehicular collisions with the following species is likely: mule deer, sage grouse, Hungarian and chukar partridge, cottontail rabbits, skunks, rodents, and raccoons. Although no sightings of either the mountain plover or the long-billed curlew have been documented near this road segment, they are known to occur along the Clarks Fork river drainage in Wyoming a few miles south of the Montana/Wyoming border. *However, extensive surveys for long-billed curlews, mountain plovers, and Swainson's hawk were conducted in June, 1989 along this road segment and no evidence of any of these species was found.*

Vehicular collisions with raptors also could be a potential impact as some species land and

feed on vehicle-killed fauna on the road and thereby expose themselves to the same fate. Both bald and golden eagles utilize this area and are known to scavenge vehicle-killed carrion. The status of the Swainson's hawk in this area is not known. Apparently suitable habitat and feeding grounds occur along this road segment, but no sightings have been documented (Flath 1988 and Stewart 1988), *and no individuals were sighted during the June, 1989 surveys.* Although the prairie dog colony just north of the road in Sec 33 T8S R22E (Table 3-5 and Exhibit 3-9) may be too small in size to support black-footed ferrets, a remote possibility of their presence exists and the precautions described in Section 5.3.6 for minimizing vehicle collisions with wildlife should be exercised.

The potential for vehicle-wildlife collisions is greatest in the early summer through the early fall months when young of the year are abundant and widely distributed. Collision potential is also higher during the hours of darkness when driver visibility is decreased and animals are blinded by headlights.

Segment 2:

Considerations involved on Segment 2 include assessments of: 1) the potential for vehicular collisions with white-tailed deer, mule deer, pronghorn antelope, sage grouse, white-tailed jackrabbit, cottontail rabbit, small birds, rodents, bald and golden eagles, prairie falcon, white-tailed prairie dogs, black-footed ferrets, and general wildlife, and 2) the impacts associated with the physical loss of wildlife habitats caused by road improvement activities.

Approximately 18.4 acres of sagebrush scrub habitat adjacent to this road segment would be eliminated during road improvement operations. The loss of this amount of sagebrush scrub habitat is not considered to be significant for the following reasons: 1) this habitat is not critical to any of the federally listed species or other high interest species in the area, 2) habitats immediately bordering roadways are generally less used by wildlife species than comparable habitats which are farther removed from roadways, and 3) the quantity of habitat removed is very small compared to the relatively large amount of undisturbed comparable habitat in the area.

As in Road Segment 1, the principle potential impact of project-associated activities along Road Segment 2 would be an increase in the potential for vehicle-wildlife collisions. The detailed description of potential impacts presented in the previous section on Road Segment 1 applies equally to this section on Road Segment 2 but to a somewhat different component of species. Unless appropriate precautions are taken, an increase in vehicular collisions with the following species would be likely: white-tailed deer, mule deer, pronghorn antelope, sage grouse, white-tailed jackrabbit, cottontail rabbit, small birds and rodents. Since this road segment bisects approximately 3.7 miles of potential sage grouse nesting habitat (Exhibit 3-9), the probability of encountering this species on the road may be particularly high. Raptor species that utilize the area and may be vulnerable to vehicular collisions include both the bald and golden eagles. Although prairie falcons occur in the area, they seldom feed on carrion and are therefore less likely to collide with vehicles. Impacts to nesting prairie falcons are not anticipated because of the distance (0.75 miles) of the access road from potential nest sites (Exhibit 3-7).

The prairie dog density in this area is not high, and the closest this road segment comes to any documented colony is 1.75 miles (Exhibit 3-9). Although the probability of encountering a black-footed ferret is remote, appropriate precautions to minimize the potential of vehicle-animal collisions as described in Section 5.3.6 should be exercised.

Segment 3:

Considerations involved on Segment 3 include assessments of potential impacts on wintering elk and mule deer; migrating, fall/rutting, and calving elk; spring/fall black bear use; and breeding and nesting habitats of Brewer's sparrow, northern oriole, yellow warbler, and blue grouse.

This segment of access bisects the habitats of the same wildlife species listed under Alternative A - Drill Site, and the detailed

description of potential impacts presented there applies equally to this analysis of Road Segment 3.

Approximately 2.2 acres of sagebrush scrub habitat, 0.7 acres of limber pine woodland, and 0.02 acres of riparian cottonwood/willow scrub habitat adjacent to this road segment would be eliminated during road construction operations. The loss of these amounts of habitat is not considered to be significant because the quantity of habitats removed is very small compared to the relatively large amounts of undisturbed comparable habitats in the area. No significant impacts to Brewer's sparrow, the northern oriole, or the yellow warbler are expected.

Segment 4:

Considerations involved on Segment 4 include assessments of potential impacts on wintering elk and mule deer; migrating, fall/rutting, and calving elk; spring/fall black bear use; and breeding and nesting habitats of Brewer's sparrow, and blue grouse.

This entire segment traverses the limber pine habitat type and bisects the habitats of the same wildlife species listed under Alternative A - Drill Site. The detailed description of potential impacts presented there applies equally to this analysis of Road Segment 4.

Approximately 1.5 acres of limber pine habitat adjacent to this road segment would be eliminated during road construction operations. The loss of this amount of habitat is not considered to be significant because the quantity of habitat removed is very small compared to the relatively large amount of undisturbed comparable habitat in the area. No significant impact to Brewer's sparrow is expected.

Alternative A Road Variations:

Levels of relative impacts to wildlife species associated with each of the Alternative A roading variations are shown in Table 4-3. Although impact potentials between the variations tend to be similar, several noteworthy differences become apparent when the extremes are compared. However, since the rankings in Table 4-3 have no universal values and different individuals might assign different values to the various species, no absolute summation of impacts is meaningful. The differences between the Alternative A road variations are not great, and any route could be implemented in a manner that would reduce potential wildlife impacts to levels considered non-significant. A possible exception to this is Variation A4 which traverses known habitats of the mountain plover and the long-billed curlew (Candidate 2 species for federal T & E listing *(Roop 1988)*). Seasonal operating constraints or re-routing of the road would be necessary in order to protect these species (Roop 1989). Rankings in the table are intended as abbreviated guidelines to illustrate those areas that would require mitigation efforts on the different Alternative A roading variations. *Extensive surveys for long-billed curlews, mountain plovers, and Swainson's hawk were conducted in June, 1989, along the Alternative A and B access roads and Alternative A Access Variations A1, A2, and A3. No evidence of any of these species was found along these routes. No survey was conducted along Variation A4 since the Wyoming Game and Fish had previously identified long-billed curlews and mountain plovers as well as habitat along this route (Roop 1988).*

4.6.3.1.2 *Proposed* Drill Site

Considerations involved on the drill site include assessments of potential impacts on winter, spring, calving and fall/rutting habitats of elk; year-round habitat of mule deer; spring/fall black bear habitats; breeding and nesting habitats of Brewer's sparrow and blue grouse; and general wildlife.

Construction of the drill pad and stockpiling of topsoil would temporarily eliminate a total of 2.5 acres of limber pine habitat, consisting mostly of sagebrush vegetation with a sparse limber pine overstory. This would result in a reduction in the amount of herbaceous and browse forage available to elk, deer, and other herbivores such as blue grouse, cottontail rabbits, and rodents that use the site. This loss would also result in a reduction in the amount of nesting and escape cover available to species such as the Brewer's sparrow, blue grouse, and various other small birds and mammals.

Table 4-3. Comparison of Wildlife Sensitivity Levels Between the Alternative A Access Route Variations.

SPECIES	Alternative A Access Route Variations			
	A1[a]	A2	A3	A4
White-Tailed Deer Habitat	Same	Most	Same	Montana/None Wyoming[b]
Mule Deer Habitat	Same	Same	None	None
Elk Habitat	Same	Same	Same	Same
Sage Grouse Nesting Habitat	3.7 mi	5.4 mi	3.7 mi	Montana/3.1 Wyoming[b]
Prairie Falcon Nesting Habitat	Same	Same	Same	Same
Mountain Plover/ Long-Billed Curlew Habitat	Low[c]	Low[c]	Low[c]	High
Bald Eagle Winter Habitat	Low	Higher	Higher	Higher
Pronghorn Antelope Habitat	Moderate	Moderate	Least	Most
Black Bear Habitat	Same	Same	Same	Same
Proximity to Prairie Dog Colony	Low	Most	Most	Montana/Low Wyoming[b]
Potential For Vehicle Collision	14.1 mi	22.9 mi	13.2 mi	18.0 mi

a - Alternative A Drill Site Variation the same as Variation A1.

b - Wyoming Status Unknown

c - Extensive surveys for long-billed curlews, mountain plovers, and Swainson's hawk were conducted in June, 1989, along each of the road access alternatives and variations (except Alternative A Road Variation 4). No evidence of any of these species was found.

The human activities associated with the construction, operation, and maintenance of the well and proximal access road would displace sensitive wildlife species. Elk, black bear, and, to a lesser extent, mule deer, would be the principle species affected. Since mule deer densities on this area are relatively low and most of these animals move further to the north and east for the winter (Stewart 1988), impacts to this species would be minor. The drilling operation would probably cause some deer to modify their activity patterns, but few are likely to be displaced from the general area and no significant impacts are expected (Van Dyke 1989 and Stewart 1989).

Elk would tend to avoid the drill site during periods of sustained human activity and could be expected to alter their movements and activity patterns to stay out of sight of the operation through the use of topography, timber, or darkness as cover. The displacement radius would vary according to availability of cover. Where exposed to similar drilling disturbances in Colorado, elk tended to avoid line-of-sight exposure over distances up to 0.75 to 1.0 miles during daylight hours, and placed either topography or dense vegetation cover, or both, between themselves and the drill site (Brekke 1985).

Under the cover of darkness elk would probably substantially reduce their avoidance distance of the drill site, with the proximity of their approach being limited by their tolerance of sounds produced there.

The magnitude and significance of elk displacement are likely to depend on the season of occurrence, the extent of comparable habitat alternatives available, the severity of the weather, and visibility or exposure of the drill rig and construction activities to elk (Brekke 1985). Displacement would be the most detrimental to elk during mid-winter (December through February) and late winter (March through April) when weather conditions are most severe, animal condition is at its lowest, and comparable habitat alternatives are the most limiting.

Displacement of elk during these time periods could result in increased stress to the elk from being forced to use less desirable habitats where snow depths may be deeper and the quality and quantity of forage poorer. Such an increase in stress load during the most demanding period of the year could result in some direct winter mortality, particularly in calves and old elk, and a reduction in calf production and survival the following spring. Displacement could also contribute to overuse of the winter forage resource on the remainder of the winter range onto which these elk would be displaced. If winter/spring forage were to become a limiting factor or is of poor quality, elk would likely turn to ranch hayfields where they are available. This alternative source of forage is available in this case along the Clarks Fork valley in Wyoming (see Exhibit 3-4) where hayfield depredation by this elk herd is already a problem, particularly during the late winter/early spring months (Roop 1988).

Although the drill site is not a major calving area, some cows remain there during the calving period (Stewart 1988 and Van Dyke 1989) and could be displaced by the proposed action. Displacement of pregnant cows and cows with new calves would increase the potential for calf mortality in a herd in which productivity is already low. Since the period immediately following calf drop is critical to calf survival, the initiation of project construction activities in the late spring should be delayed until calves are old enough to travel with their cows without undue danger. According to Van Dyke (1989) and Stewart (1989) adequate protection to calves would be afforded if construction activities were initiated no earlier than June 15.

Based on the work of Brekke (1985) and Ward (1985), it is estimated that the proposed action would cause elk to exercise line-of-sight avoidance behavior to the well drilling operation. As pointed out in Section 3.7.2.2 and illustrated in Exhibit 3.11, the viewshed surrounding the drill site is approximately 970 acres. During years of normal climatological conditions drilling activities on the Ruby site up through November 15 would displace elk from approximately *1.5* of the 23 square miles of available fall range (*6.59* percent) and would be of little consequence because of: 1) the relatively few numbers of animals on the project area during this time window, 2) the relative abundance of comparable alternative habitats during this season, and 3) the

usually peak physical condition of animals during this time of year. However, during unusual fall seasons when abnormally dry conditions prevail, or when extremely deep snow depths occur unseasonably early, the habitat options of elk are greatly reduced and the animals are concentrated on lower elevation areas which include the proposed drill site (Van Dyke 1989 and Stewart 1989). During such fall seasons, continued project activities on the drill site after September 15 could cause significant impacts by displacing elk from a key area at a time when viable alternative habitats are in short supply and cows and calves need to add fat reserves that are critical for winter survival (Van Dyke 1989 and Stewart 1989). Displacement of elk from the Ruby Creek area during such years would reduce their use of available fall habitats by approximately *15* percent by denying them the use of approximately *1.5* of the 10 square miles of habitat available.

Because the drill site is on a prominent bench, equipment located there is highly visible throughout the drainage and is likely to contribute substantially to the development of avoidance behavior in elk (Lyon et al. 1985). If the drill rig is left on the site following cessation of drilling activities in the fall, it is likely to continue to act as a displacement object to elk and may cause a continuation of their avoidance of the site and adjacent areas. Since Van Dyke (1989) has demonstrated that this site is an important part of fall elk range and is on a travel corridor used frequently by elk during the spring and fall it is important that major visual barriers be removed from the site during the period of fall, winter, and spring elk use of the area.

The displacement of one or several black bears from portions of their spring or fall habitats is not normally expected to create a significant impact on this species due to the availability of relatively large amounts of comparable, alternative seasonal habitats. During dry falls, mesic habitats such as the Ruby Creek draw become more important to both bears and elk, and displacement would have greater impact. Because the potential for impacting spring/fall black bear use of the area is predicated on the same climatological and time constraints described above for elk, black bear use of the drill site and adjacent area is not likely to be impacted if these constraints are followed (Stewart 1989).

Since no significant impacts to the prey base *(mule deer/elk)* of cougars in the project area is anticipated, the proposed project is not expected to adversely affect cougars. Van Dyke (1989) feels that if firearms are prohibited on the drill sites, there would be no significant impacts to resident cougars, as they can be expected to change their activity and behavior patterns so as to avoid contact with construction and drilling operations.

Proposed project activities are not expected to impact the spotted bat, if present, in that the only human related activities identified as detrimental to this species are those which eliminate water near sedimentary cliffs or activities that destroy cliff faces and canyon walls (Snow 1974 and Clark and Dorn 1981).

The probability of occurrence of the grizzly bear, wolverine, and North American lynx on the drill site is so remote that any impact to these species is very unlikely. Since no raptor nests are known to occur on or near the drill site, no impacts to these species are expected.

4.6.3.1.3 Alternative A Drill Site Variation

Considerations involved on this drill site include assessments of potential impacts on winter, spring, calving, and fall/rutting habitats of elk; early and late winter, and spring/fall transition range of mule deer; spring/fall black bear habitats; breeding and nesting habitats of Brewer's sparrow and blue grouse; and general wildlife.

This drill site exhibits habitats of the same wildlife species as the Alternative A drill site. With one exception, the detailed description of potential impacts presented under the proposed drill site applies to the variation drill site. The Alternative A Drill Site is located on a saddle or topographic bench which lies on a route heavily traveled by elk moving between drainages, while the Alternative A Drill Site Variation does not occur on the saddle or bench (Van Dyke 1988b). Elk naturally use and move through the Alternative A Drill Site Variation, but not to the extent that they use

the Alternative A Drill Site. Therefore, the magnitude of impact to elk under the Alternative A Drill Site Variation could be less than for the proposed drill site.

4.6.3.2 Alternative B - Gold Creek Site

4.6.3.2.1 Access Route

Potential impacts to wildlife species are analyzed separately for each of the four access road segments previously described under the Wildlife Section of Chapter 3. Access road segments are numbered in chronological order proceeding from Montana State Highway 72 and progressing westward to the drill site (Exhibits 3-6 and 3-7).

Segment 1:

Because this segment is identical to Segment 1 under Alternative A, assessment considerations and potential impacts to wildlife are the same as those previously described.

Segment 2:

Considerations involved on Segment 2 include assessments of: 1) the potential for vehicle collisions with white-tailed deer, mule deer, pronghorn antelope, sage grouse, white-tailed jackrabbit, cottontail rabbit, small birds, rodents, bald and golden eagles, prairie falcon, white-tailed prairie dogs, black-footed ferrets, and general wildlife, and 2) the impacts associated with the physical loss of wildlife habitats caused by road improvement activities. The eastern 4.2 miles of this segment of access bisects sagebrush scrub habitat while the western 1.1 miles traverses limber pine habitat, and crosses the riparian habitat of Gold Creek in one place.

The 4.2-mile segment of roadway that traverses sagebrush scrub bisects habitats of the same wildlife species as Segment 2 of the Alternative A Access Route, and with minor differences, the detailed description of potential impacts presented there applies equally to Segment 2 of the Alternative B Access Route described here. The minor differences involve the amounts of potential sage grouse nesting habitat bisected by the respective road segments, the amounts of sagebrush scrub eliminated by proposed road improvements, and distances to the nearest sage grouse lek and white-tailed prairie dog colony.

This access parallels limestone cliffs in which Anderson (1989) suspects prairie falcons nest (Exhibit 3-7). Proposed road construction to this segment of access may or may not pose the potential for impacting nesting falcons. Whether or not an impact occurs depends on: 1) whether or not the falcons are currently maintaining an active nest in these cliffs, 2) the location in the cliffs of such an active nest, and 3) the seasonal time schedule of road construction in the vicinity of the cliffs. If the location of the nest is far enough removed from the road construction, (e.g., in the north facing cliffs or on the south end of the east facing cliffs), no impact is likely. If an active nest is located in the south facing cliffs or on the north end of the east facing cliffs, road construction may cause nest abandonment during the incubation and early-nesting phases of the nesting cycle (April through May). Regular road traffic is not expected to cause impacts for several reasons. First, the road is north of and parallel to the top edge of the south facing cliffs and is not visible to birds that might be present on these cliffs, and second, the road is far enough removed from the east and north facing cliffs to make disruption of nesting birds unlikely.

Segment 2 of the Alternative A Access Route bisects 3.7 miles of potential sage grouse nesting habitat, would eliminate 18.4 acres of sagebrush scrub habitat, and passes within 0.6 miles of the nearest sage grouse lek and within 1.75 miles of the nearest prairie dog colony. Segment 2 of the Alternative B Access Route bisects no designated sage grouse nesting habitat, would eliminate 10.2 acres of sagebrush scrub habitat, and passes within 1.8 miles of the nearest sage grouse lek and within 2.8 miles of the nearest prairie dog colony (Exhibit 3-9).

The 1.1-mile portion of this segment that traverses limber pine habitat bisects habitats of the same wildlife species listed under Alternative B - Drill Site. The detailed

description of potential impacts presented there applies equally to Segment 2 of the Alternative B Access Route described here.

Approximately 10.2 acres of sagebrush scrub, 2.7 acres of limber pine, and 0.03 acres of riparian cottonwood/willow scrub habitats adjacent to this road segment would be eliminated during road construction operations. These reductions in habitats are not considered to be significant because the quantities of habitats removed are very small compared to the relatively large amounts of undisturbed comparable habitats in the area. No significant impacts to Brewer's sparrow, the northern oriole, or the yellow warbler are expected.

Segment 3:

Considerations involved on Segment 3 include assessments of potential impacts on wintering elk and mule deer; migrating, fall/rutting, and calving elk; spring/fall black bear use; and breeding and nesting habitats of Brewer's sparrow and blue grouse.

Since this entire 0.4 mile segment bisects habitats of the same wildlife species listed under Alternative B - Drill Site, the detailed description of potential impacts presented there applies equally to Segment 3 of the Alternative B Access Route described here. Approximately 2.2 acres of limber pine habitat adjacent to this road segment would be eliminated during new road construction operations. This reduction in habitat is not considered to be significant because the quantity of habitat removed is very small compared to the relatively large amount of undisturbed comparable habitat in the area. No significant impacts to Brewer's sparrow are expected.

Segment 4:

Considerations involved on Segment 4 include assessments of potential impacts on wintering elk and mule deer; migrating, fall/rutting, and calving elk; spring/fall black bear use; breeding and nesting habitats of Brewer's sparrow and blue grouse; and general wildlife. Since this entire 0.5-mile segment traverses limber pine habitat and bisects habitats of the same wildlife species listed under Alternative B - Drill Site, the detailed description of potential impacts presented in that section applies equally to this section of roadway. Approximately 2.4 acres of limber pine habitat adjacent to this road segment would be eliminated during road construction operations. This reduction in limber pine habitat is not considered to be significant because of the relatively large amount of undisturbed comparable habitat in the area. No significant impact to Brewer's sparrow is expected.

4.6.3.2.2 Drill Site

Considerations involved on the drill site include assessments of potential impacts on winter, spring, calving, and fall/rutting habitats of elk; early and late winter, and spring/fall transition range of mule deer; spring/fall black bear habitats; breeding and nesting habitats of Brewer's sparrow and blue grouse; and general wildlife.

This drill site exhibits habitats of the same wildlife species as the Alternative A drill site, and with a few exceptions, the detailed description of potential impacts presented there applies equally to the Alternative B drill site. One exception involves the fact that elk tend to leave the Gold Creek site earlier in the fall and return to it later in the late winter/early spring than they do the Ruby Creek site (Stewart 1988 and Van Dyke 1988). Also, the Gold Creek site is not utilized as much as a direct travel lane as the Ruby site is (Van Dyke 1988). If winter drilling was performed, the magnitude of displacement of elk from the Alternative B site during the winter months would likely be smaller than from the Alternative A site. A second exception is that mule deer do not occur on the Gold Creek site year-round, as they do on the Ruby Creek drill site, but use the area during the early and late winter, and during spring/fall migrations (Van Dyke 1989 and Stewart 1989). Although the drilling operation would probably cause a few deer to modify their activity patterns, they are not

likely to be displaced from the general area, and therefore, no significant impacts are expected (Van Dyke 1989 and Stewart 1989).

A total of three acres of limber pine habitat, consisting mostly of sagebrush vegetation, would be temporarily eliminated during the construction of the drill pad and the stockpiling of topsoil.

4.6.4 Impacts Summary

Significant impacts, as previously defined in this section, could occur, but are avoidable and unlikely to happen with implementation of mitigation measures prescribed in Chapter 5. Significant impacts that, unless mitigated, could occur are listed in the order of their decreasing probability: 1) the displacement of elk from the winter, spring, and fall ranges, 2) the displacement of black bears from spring/fall ranges, 3) an increase of more than ten percent in the short-term direct mortality of wildlife species caused by collisions with motor vehicles, and 4) the death or injury of a federally-listed or candidate species of wildlife caused by a collision with a motor vehicle.

As detailed below and in Table 4-3, the probability for significant impacts to wildlife, and the intensity of such impacts, is generally greater under Alternative A than either *the Alternative A Variation or* Alternative B; however, the application of prescribed mitigation measures would reduce impact potential and allow *any* of the proposed alternatives to be performed without the production of significant impacts to wildlife.

The viewshed surrounding the Alternative A Drill Site Variation is approximately 485 acres, or about one-half that of the Alternative A Drill Site (Exhibit 3.11). Because the viewscape is only half as large and the drill site is farther removed from the saddle frequented by elk during between-drainage movements, the magnitude of displacement potential produced by the Alternative A Variation can be expected to be approximately half that produced by Alternative A.

The Alternative B drill site is more peripheral to the main body of the elk winter range, is less used by elk during the winter, and is less of a travel corridor during seasonal elk movements than the Alternative A *and Alternative A Variation* drill sites. The visual impact of the drilling and construction activities and its probable displacement effect on wintering elk would be lower on the Alternative B drill site than on the Alternative A or Alternative A Variation drill sites because of differences between the drill sites in topography, seasonal elk distribution and movement patterns, and distances from the core of the elk winter range.

More winter and transition range forage of elk (10.7 vs 8.8 and 9.8 acres) and more total acres of wildlife habitats (25.3 vs 23.4 and 20.3 acres) would be eliminated in Alternative A than in the Alternative A Variation and Alternative B, respectively.

The potential for road-killed wildlife would be somewhat higher under Alternative A because this alternative traverses more total miles (from 14.2 to 22.9 miles depending on access route variation) of wildlife habitats than the Alternative A Variation (13.5 to 22.2 miles depending on access route variation) or Alternative B (11.2 miles). Alternative A and the Alternative A Variation traverse the same amount of sage grouse nesting habitat (3.7 miles), while Alternative B traverses none.

4.6.5 Cumulative Impacts

Although *all* of the proposed drill sites are already relatively easily accessible via field vehicles, the improvement of access roads will increase the potential for use of the area by the general public. However, circumstances that will moderate this potential for greater use include: 1) the fact that the proposed access routes traverse gated private lands, and 2) the fact that vehicle access behind the Forest boundary is currently prohibited and blocked by gates. Increased use of the area by the general public is not expected to be of sufficient magnitude to significantly impact wildlife.

The performance of drilling and construction activities would increase the total proportion of the year during which Line Creek elk are exposed to human disturbances (e.g., hunting, snow machines, etc.). In the absence of appropriate mitigation measures, the addition of drill site disturbances to the displacement

effects produced by the traditional fall hunting season are likely to be significant during unusual fall seasons when abnormally dry conditions prevail, or when snow depths are extreme unseason-ably early. This additive effect would be the most pronounced during the early fall (September 15 - October 15). During this time frame bow hunters can be expected to move elk around within the Ruby drainage but are not likely to displace them from the entire drainage (Stewart 1989). During an active drilling operation, however, the elk would tend to avoid the drill site during daylight hours and alter their movements and activity patterns to stay out of sight of the operation through the use of topography, timber, or darkness as cover. During daylight hours elk would tend to avoid line-of-sight exposure to the drill sight and construction activities by distances of up to 0.75 to 1.0 miles (Brekke 1985), and would likely be temporarily displaced from the respective Ruby Creek or Gold Creek drainage. Such a displacement would, during the September 15 - October 15 period of a climatologically abnormal fall season, produce a potentially significant negative effect on the elk by substantially reducing the amount of time they are able to utilize the forage on and adjacent to the drill sites, which are key areas during fall seasons and tend to be abnormally dry or sustain unseasonably early and heavy snowfall (Van Dyke 1989).

Later in the fall (October 15 - November 15) the additive effect of drilling disturbances plus the displacement created by rifle hunting would likely be quite different (Stewart 1989). When rifle hunters arrive in the vicinity of either of the drill sites the elk would have already been displaced from the entire drainage containing the well. However, the displaced elk would merely be in the places that the first few hours of rifle season would normally displace them to anyway (Stewart 1989). This cumulative or additive effect is not considered to be significant.

The increase in project-related traffic on the access route would likely elevate the numbers of vehicle-killed and injured wildlife unless the precautions for minimizing vehicular collisions with wildlife described in Section 5.3.6 are exercised. Of particular importance would be measures to minimize the probability of collision with a federally listed threatened or endangered species such as the bald eagle.

When there is a substantial reduction in quality habitat options during the fall season (September 15 - November 15) due to climatological events, such as drought, heavy snow fall, fire, etc., the increased displacement impact created by the addition of well-drilling activities to the existing bow hunting activities would likely have a significant negative effect on elk unless the mitigation measures described in Section 5.3.6 are exercised. During a year of normal climatological events, the performance of proposed activities on either of the alternative drill sites between June 15 and November 15 is not expected to have a significant impact on elk productivity or survivorship (Stewart 1989 and Van Dyke 1989). Cumulative impacts associated with field development are described and discussed in detail in Appendix B.

4.6.6 Mitigation Summary

In order to minimize the probability of displacing elk from their seasonal transition, fall/rutting, winter, and calving habitats, project operations within designated elk habitats should be limited to the period extending between June 15 and November 15 during years of normal climatological events. During years of abnormal climatological events (drought, unseasonably early and heavy snow, extensive fire, etc.) drilling operations should be terminated on a designated date, between September 15 and November 15, when or if FS officials, in consultation with MDFWP biologists, determine that the continuation of operations beyond that date would have a significant negative impact on elk, according to the impact significance criteria defined in Section 4.6.2.

In the event that drilling cannot be completed in a single operational period (June 15 - November 15), the rig should be dismantled and removed from the elk range. To avoid the possibility of elk developing a permanent or long-term avoidance behavior towards the drill site, drilling activities should not continue through November 15 for more than two consecutive years. Noise levels at the drill site

should be maintained at low enough levels to minimize disruption and displacement of elk. (A maximum noise level will be designated in the FEIS). Road maintenance and construction work outside of designated elk habitats can be performed at any time without impacting elk. In order to facilitate big game movements and minimize the potential for injuries, road access rights-of-way should not be fenced.

The potential for vehicle/wildlife collisions could be reduced substantially by requiring all drivers to undergo a training session describing the type of wildlife in the area that is susceptible to vehicular collisions, the circumstances under which such collisions are likely to occur, and the measures that could be employed to minimize them. The probability of animal/vehicle collisions could be further reduced by imposing speed limits on access roads and prohibiting night travel. If night travel cannot be eliminated, speed limits should be further reduced during the hours of darkness.

Because black bears are common in the area, steps should be taken to minimize the possibility of attracting them and to avoid possible human/bear encounters. All personnel should be informed and educated regarding actions and circumstances that are likely to result in human/bear encounters and the measures that could be taken to minimize the potential for such encounters. The prescribed Interagency Grizzly Bear Guidelines (Interagency Grizzly Bear Study Team 1986) for food handling and storage and the disposal of garbage should be followed so as to minimize the possibility of attracting bears. No dogs or firearms should be allowed on the drill site or project. Any bear problem should be reported promptly to biologists of the MDFWP. The same climatological and time constraints, described previously in this section for elk, are equally applicable to black bears and should be exercised in order to avoid impacts to this species (Stewart 1989).

In order to reduce potential incidents of game law violation all project workers should be instructed on local wildlife regulations and state wildlife laws and regulations posted in conspicuous places at the job sites. Personnel should also be instructed about the nature of the wildlife species that occur on the work site, potential impacts to these species and measures that could be taken to avoid or minimize impacts. Project workers should report bear sightings, raptor nests, and other noteworthy wildlife occurrences to MDFWP.

The drill site and adjacent disturbed habitat should be reclaimed to approximate pre-project levels for vegetative cover and physical condition in the event of a dry hole. During reclamation a variety of forage species that are useful to resident herbivores should be established (See Appendix D).

In order to reduce *potential* incidents of game law violation all project workers should be instructed on local wildlife regulations and state wildlife laws and regulations posted in conspicuous places at the job sites. Personnel should also be instructed about the nature of the wildlife species that occur on the work site, potential impacts to these species and measures that could be taken to avoid or minimize impacts. Project workers should report bear sightings, raptor nests, and other noteworthy wildlife occurrences to MDFWP.

If Alternative B is selected, a survey should be conducted to determine whether or not there is an active prairie falcon nest in the limestone cliffs adjacent to access Segment 2. If an active nest is found within the zone of influence of the access road, it may be necessary to delay road construction activities until late into the young-rearing period (early June).

A helicopter survey of cliff habitats in the vicinity of the proposed drill sites should be performed prior to commencement of drilling activities to determine whether or not peregrine falcons are nesting there. Survey procedures should be conducted under the direction of the FWS and MDFWP in strict compliance with their specifications. In the event nesting activities are found, the FWS and MDFWP should be consulted immediately and appropriate mitigative actions developed and implemented.

4.6.7 Unavoidable Adverse Impacts

Unavoidable adverse impacts that would occur throughout the life of the project on either of

the alternatives include: 1) some increase in the potential for vehicle-related wildlife injuries, stress, and mortality, 2) loss of some wildlife habitat, and 3) the displacement of sensitive wildlife species from some habitats. The implementation of mitigation measures summarized previously would fully mitigate or reduce all significant impacts to levels not considered significant.

4.7 VISUAL RESOURCES

4.7.1 Introduction

Short-term visual impacts associated with construction of this proposal would include visual contrasts between the industrial character of the construction equipment, the drilling operation, and the characteristics of the undisturbed surrounding landscape. In addition, heavy volumes of truck traffic and fugitive dust could produce negative visual impacts beyond the immediate site. Both short-term and long-term impacts to the visual resource would be possible where patterns of area, line, form, color, and texture in the existing characteristic landscape would be visually contrasted by drilling equipment and/or construction-related damage to vegetation, topography or other visible site features. The severity of impact depends upon the visual absorption capability and distance from the most sensitive viewing area, reclamation potential of the landscape disturbed, and the level of visual disturbance of the resource created by the proposed action. The duration of the impact would be a function of the time required to complete the action and the time required for the site to return to a predisturbance condition. In general, impacts would be most severe on sites where mitigation would be difficult and/or where visual contrast would be highly visible to potentially large numbers of viewers.

4.7.2 Impact Significance Criteria

The following criteria were used to determine the significance of impacts to visual resources due to the proposed action or alternatives:

- Implementation of the proposed action or alternatives would violate forest wide management direction and/or management area direction as described and mandated by the Custer National Forest LRMP and EIS (USDA-FS *1987b*) and the Billings Resource Area RMP (USDI-BLM 1983).

- Where alteration would occur to any characteristic landscape being managed under a Preservation Visual Quality Objective (VQO).

- Where alteration of the existing characteristic landscape would produce contrasts beyond the degree allowed for in a VQO, where contrasts would be visible to potentially large numbers of viewers and would appreciably diminish the aesthetic experience of these viewers.

- Where alteration of the existing characteristic landscape within any VQO would be severe enough that on-site mitigation would not bring the affected area into compliance with an acceptable degree of visual contrast for a VQO within the specified time period.

- Where changes created by the proposed action, in conjunction with other present actions, proposed future actions, and potential actions permitted under present management direction, that alter the overall character of the characteristic landscape from Scenic Natural to Man-Natural Mix, from Man-Natural Mix to Man-Dominated, from Common Natural to Man-Dominated, or from Common Natural to Man-Natural Mix, based on FS Visual Quality Objectives. (See Glossary for definitions.)

4.7.3 Direct and Indirect Impacts

4.7.3.1 Alternative A - Proposed Action

4.7.3.1.1 Access Route

Reconstruction of the access road across private property and BLM-administered land would increase the level of contrast already associated with the existing road; an existing man-natural mix in landscape character. However, the road is not readily visible from most viewer locations, so the increase in contrast would not be considered significant.

Improvements to the 0.8 miles of existing unimproved two-track road on Forest land would require removal of vegetation, cutting, and filling. The disturbance and increased road width would result in a more obvious contrasting line in the landscape. Topographic and vegetative screening would limit visual access to this section from most observer positions, the exception being Face-of-the-Mountain Trail. Whether the impact would be considered significant from this trail and similar observer normal or superior viewer positions would depend on FS interpretation of the VQOs for Management Area C.

Approximately 800 feet of new road would be constructed across a steep sideslope. Construction activities would produce cut and fill slope exposing up to 25 vertical feet of bare soil. Much of the road would be screened from view, but two sections, each approximately 100 feet in length would be exposed to view. The contrast in form and color created by disturbance in these areas would exceed standards permitted under Partial Retention. With implementation of best management practices and mitigation listed in Chapter 5, these impacts could be effectively reduced. No indirect impacts should occur.

The nature and extent of impacts for access road Variations A2, A3, and A4 would be similar to those described for Phillips' proposed access (A1). These variations are closer to Montana Highway 72 (Exhibits 1-2 and 3-2), are close to several residences, and involve public county roads used by recreationists, such that the magnitude of impacts for these variations would be greater than for Variation A1. Variation A2 would potentially cause the greatest impact since this route involves both the Meeteetse Trail and Robertson Draw roads which are public roads. Variation A2 would involve 15.8 miles of public road while Variations A3 and A4 would involve 7.1 miles and 8.5 miles of public road, respectively. The experiences of recreationsists using the public roads could be affected due to increased truck traffic and dust which detract from the aesthetic qualities of the area. Thus, implementation of variation A2 could potentially cause the greatest magnitude of impact of the variations.

4.7.3.1.2 *Proposed* Drill Site

In the short-term, impacts to the visual resource associated with construction of the proposed drill site would be considered significant from all viewing points (See Exhibit 3-11) because they would not meet a VQO of Retention, Partial Retention, or Modification; and would change the landscape character from Common Natural to Man-Dominated mix. Cut and fill slopes of 28 feet on a face pitched toward most primary viewer positions would result in changes in form, color, and texture that contrast markedly with the adjacent undisturbed landscape. The rectangular drill pad form is foreign to the characteristic landscape. In addition, the size, form, and possibly color of the 162-foot tall drill rig would extend well above screening vegetation and would dominate the immediate environment. The drilling rig would be visible from Highway 72, Grove Creek Road, Robertson Draw Road, Meeteetse Trail road, and the Face-of-the-Mountain Trail and would dominate the foreground of this trail. Lighting of the drill rig tower would extend the visual impact into nighttime hours. The lights would be visible from a large area to the east of the project. The noise generated during drilling and construction activities could further degrade the aesthetics of the project area.

These impacts would persist for the duration of drilling activity. The fence that would be constructed around the drill site would not add to the visual impacts due to drilling activities since it would be screened from most viewer locations and would blend with the industrial nature of the drill site. Should the drilling process extend to a second season, the drill rig could potentially be stacked on-site during the late fall, winter, and spring period. Drill rig stacking compared to leaving the rig mast up would reduce visual impacts during this six-month period. If the rig could not be stacked on-site, then it would be stacked in Section 13 out of public view.

If producible quantities of oil and/or gas are not encountered, removal of the rig, reclamation of the pad to approximate original contour, and successful implementation of recommended mitigation procedures could bring the drill site up to a Partial Retention level in the long-term with landscape

character changing from Man-Dominated Mix to Man-Natural Mix. However, if producible quantities were encountered, the cut and fill slopes of the new road would be secured for a two- to three-year interim period while additional environmental analysis (i.e., environmental assessment and/or environmental impact statement) was conducted and the FS and BLM reached a decision concerning well production and field development. Thus, impacts to the visual resource would remain during this interim period with a Man-Dominated Mix.

4.7.3.1.3 Alternative A Drill Site Variation

Visual impacts resulting from access to the Alternative A Drill Site Variation would be similar to those discussed for Alternative A, with the exception of visual impacts resulting from new road construction across an 800-foot segment of steep slopes required to access the Alternative A drill site on Forest land. Access to the drill site variation would not require this segment of new road construction and, therefore, the magnitude of visual impacts would be reduced.

The impacts associated with construction and drilling at the variation drill site would be similar to those described for the proposed drill site; although the magnitude of impacts would be less at the variation drill site. The visual absorption capacity of the sagebrush at the variation drill site is lower; therefore, impacts associated with the site could be more visible with the reduced screening. However, the viewshed for the drill site variation is smaller as shown in Exhibit 3-11. The variation drill site is located 500 feet below the saddle, and 2,100 feet further east of the proposed drill site location and users of the Face-of-the-Mountain Trail would have reduced visual access to this site. As such, visual impacts associated with the variation drill site would be reduced from the impacts of the proposed drill site.

4.7.3.2 Alternative B - Gold Creek Site

4.7.3.2.1 Access Route

Reconstruction of existing access roads would be of a magnitude similar to those described for the proposed access. Construction of the final 0.9 miles from the abandoned Amoco drill site to the Alternative B drill site would require new road construction, including minor cutting and filling. Because of the large number of boulders in this section of landscape, the probability of windrows of boulders paralleling the road during the construction period is high. The result would be an increase in the level of line contrast. As with the proposed access, this access route could be brought into compliance with Partial Retention standards through successful implementation of recommended mitigation measures presented in Chapter 5. No indirect impacts are anticipated.

4.7.3.2.2 Drill Site

Impacts associated with the construction and operation of this drill site would be similar to those described under Alternative A, with the following exceptions: cut slopes would reach 29 feet and fill slopes 33 feet and therefore, would be more visible. This site has a lower VAC, thus all visual contrasts created by the action would be more visible than at the proposed site (See Exhibit 3-11).

4.7.4 Impacts Summary

The short-term impacts to the viewers in the project area associated with the construction of the drill pad and erection of the drill rig at either of the *three* drill sites would be considered significant from most viewer positions (See Exhibit 3-11) because they would exceed the level of contrast in line, form, and possibly color permitted in Retention, Partial Retention, or Modification zones. Impacts associated with the *Alternative B* drill site would be most severe. Rig lights would be visible from a large area to the east of the project area including State Highway 72, Grove Creek Road, Meeteetse Trail, and Robertson Draw Road. *Rig lights would be least visible with the Alternative A Drill Site Variation. Similarly, the variation drill site would be least visible from the Face-of-the-Mountain Trail of the drill site locations.* Removal of the drill rig and application of recommended mitigation would bring the sites into compliance with Retention, Partial Retention, and Modification VQOs. Management direction, therefore, could be

violated in the short-term but would not be violated in the long-term depending on FS interpretation of Management Area C VQOs.

The construction of access roads to either *of the three drill* sites would produce additional impacts to the visual resource. Widening of existing unimproved two-track roads and construction of new road on Forest lands would increase the level of line contrast in the existing landscape. The level of contrast would be considered significant from observer normal and superior viewer positions (See Exhibit 3-11), particularly from the Face-of-the-Mountain Trail, and could be considered significant depending on FS interpretation of Management Area C VQOs. Construction of access to the proposed site would cause more severe impacts than access to the *Alternative B* site*; however, the severity of impacts would be reduced with the implementation of the Alternative A Drill Site Variation.* The project would not impact areas currently classified as Preservation.

Most or all of the areas affected by project implementation would not be visible from the proposed Meeteetse Spires Preserve, and therefore, the preserve would not be impacted in regard to visual aesthetics.

4.7.5 Cumulative Impacts

With the exception of the existing roads and abandoned Amoco drill site, there is little visual evidence of previous impact *to the project area* due to existing or past resource use or management. No new management activities that would affect the visual resource are planned in the immediate area. The landscape character type would be described as Common Natural. The proposed action, in conjunction with visual evidence of past action, would lower the overall visual character from Common Natural to Man-Natural Mix until mitigation measures have had sufficient time for revegetation to completely establish itself on all visible areas of disturbance. Once vegetation is re-established, the site would return to a Common Natural character type. Appendix B discusses impacts due to field development and indicates that cumulative impacts on the visual resource would be substantial.

4.7.6 Mitigation Summary

4.7.6.1 Access Roads

During construction, protect existing vegetative cover, trees and shrubs, in particular, at the edge of the right-of-way (ROW). Regrade and revegetate in the manner described in the Drill Sites section below; replace windrowed boulders as described below. To reduce the short-term adverse impacts associated with road construction, take steps to minimize fugitive dust.

4.7.6.2 Drill Sites

All permanent structures should be painted a flat, non-contrasting color that is harmonious with the adjacent landscape, except for structures that require safety coloration in accordance with Occupational Safety and Health Administration (OSHA) requirements. Maintain existing screening vegetation by minimizing the removal of trees and shrubs. After completion of well construction and drilling, recontour the pad to approximate original contours. Revegetate with indigenous or adapted species that *blend with the* native plant community character and phenology. Planting should occur at the earliest suitable planting date. Replace boulders on the Alternative B drill site area in a pattern that reflects boulder arrangement in adjacent undisturbed areas. Remove all post-construction debris immediately after construction. Appendix D presents a site-specific reclamation plan for the project.

4.7.7 Unavoidable Adverse Impacts

The significant short-term impacts to the visual resource associated with drilling activities are inherent in the operation and thus unavoidable. Removal of the drill rig and successful implementation of the recommended mitigation would reduce the high contrast between the disturbed area and the adjacent landscape, thus reducing visual impacts to levels not considered significant in the long term. If producible quantities of oil and gas were encountered, the visual impacts would remain during the interim two- to three-year period.

CHAPTER 4

4.8 RECREATION

4.8.1 Introduction

Petroleum exploration and development activities of the type proposed could impact the recreation activities and opportunities now present in the study area. Although recreational use of the project area is low, some recreational activities could be altered or displaced as a result of project activities such as drill site construction, well drilling, road construction, road use, equipment noise, or visual intrusions. Project activities may result in a deterioration of recreation opportunities and experiences even when displacement of recreationists does not occur. Such changes may lead to corresponding declines in the levels of satisfaction that users derive from participating in recreation activities in the area.

Previous analyses of petroleum exploration proposals in the Beartooth District have documented public concerns regarding recreation resource effects of such projects, particularly effects on hunting opportunities (USDA-FS 1985). Also, comments provided by members of the public during the scoping process focused specifically on concerns about the effects of project activities on recreation. These areas of concern are addressed in the following discussion of potential recreation impacts that could result from the alternatives under consideration.

4.8.2 Impact Significance Criteria

The following criteria were used to evaluate the potential significance of recreation impacts. The intensity of potential impacts on recreation resources varies in part as a function of the duration of project activities.

In general, project impacts that are identified using these impact significance criteria but that would persist for no more than one year or one season of use are considered insignificant.

- The presence of project activities and facilities that would alter recreation opportunities, as represented by a revision of Recreation Opportunity Spectrum (ROS) area designations within a recreation analysis area encompassing the drill site, access route, and surrounding Forest lands, as follows:

  1. A greater than ten percent reduction in the amount of acreage designated as providing Primitive (P) recreation opportunities.

  2. A greater than 15 percent reduction in the amount of acreage designated as providing Semi-Primitive Non-Motorized (SPNM) recreation opportunities.

  3. A greater than 20 percent reduction in the amount of acreage designated as providing Semi-Primitive Motorized (SPM) recreation opportunities.

- A deterioration of the quality of recreation experiences or a reduction in the level of recreation use due to one or more of the following:

  1. Decreased populations of game or fish species.

  2. Levels or patterns of project activity that would displace or disrupt existing private or commercial recreation uses.

  3. Increased levels of human activity that would reduce recreationists' perceived levels of isolation or solitude.

  4. Construction of project-related facilities or roads within 200 feet of either side of the centerline of any and all designated trails.

4.8.3 Direct and Indirect Impacts

4.8.3.1 Alternative A - Proposed Action

Drilling activities associated with this alternative would result in moderate changes in the recreation opportunities and qualities that are presently available in the area surrounding the proposed access route and drill site. The SPNM (summer) designation for recreational opportunities on the Line Creek Plateau to the west would not be affected because the drill site is more than 0.5 miles from the rim of the plateau. Moreover, both

the distance from the drill site and the effects of steep terrain and elevation differences would result in a topographic screening effect that would prevent most recreationists on the plateau from seeing or hearing any project activities (See Exhibit 3-11). The current SPM designation for the area surrounding the drill site itself, however, would be inconsistent with the level of project activity and the extensive use of motorized equipment that would occur. A strict interpretation of the ROS guidelines suggests that these activities would sufficiently alter the recreation setting to necessitate a redesignation of approximately 530 acres surrounding the project facilities from SPM to Roaded Natural (RN), as indicated in Exhibit 4-1. This would be substantially less than 20 percent of the SPM acreage in the analysis area, and would therefore not represent a significant impact. Moreover, unless subsequent field development were to occur, this change in ROS conditions would be of relatively short duration and would therefore not require a formal redesignation of the ROS classification for the affected area. Any inconsistency with the existing ROS designation would persist only until the completion of reclamation activities, at which time conditions in the area would again be consistent with the SPM designation.

However, it is possible that the site would not be reclaimed for a period of two to three years between the completion of exploratory drilling and a decision regarding field development should producible quantities of oil and/or gas be encountered. For that period the recreation opportunities available in the area would continue to be negatively impacted, but at a lower level than during construction and drilling since little, if any, activity would occur at the drill site.

During the period required for road construction and exploratory drilling, recreational experiences and activities that occur in the immediate vicinity of the drill pad and access road could be displaced into other nearby areas as a result of construction and operating activities. The dust, fumes, and visual alterations associated with drilling, road construction, and other project-related equipment use, could force the relocation of some recreationists from a larger surrounding area, and a reduction in the quality of recreation experiences for others. Project noise could cause a deterioration of the recreation experiences of users in an even broader area surrounding the drill site and access route. However, the low number of recreationists using the project area would limit the extent of such effects and most users could relocate their activities to suitable alternative recreation sites elsewhere on the Beartooth Face that are at least as accessible. The low number of hikers and others using the Face-of-the-Mountain Trail would be exposed to visual and noise effects of the project while using trail sections within a mile or so of the drill site. Off-Forest motorized recreation activities on the Meeteetse Trail and other public roads could be affected slightly by the presence of crossing project traffic under roading Variations A1 and A4, and more substantially by project vehicle use of sections of these public roads under roading Variations A2 and A3. Overall, the low number of users and the localized nature of most effects suggest that such impacts would be minor, even if the exploratory activity lasts for two or three seasons. Minor improvement of the Meeteetse Trail under Variation A2 or minor improvement of the Robertson Draw Road under Alternative A3 could facilitate recreational travel on these roads.

Short-term impacts on hunting would occur during the exploratory drilling period. The planned period of site occupancy would require drilling activities to end by October 14, well after the beginning of hunting in early September. Consequently, there would be some conflict between the drilling activity and fall hunting. Drilling activity would continue during most of the elk archery and rifle seasons. The one commercial outfitter who guides elk hunters in the project area during archery season would be inconvenienced by the project but could continue to use other areas along the face of the Line Creek Plateau as well as higher ground nearer to the top of the plateau. Project activities would not begin until late spring or early summer after the period when spring bear hunting occurs.

The overall effects of exploratory activities would involve inconvenience for some hunters and would contribute to a deterioration of the

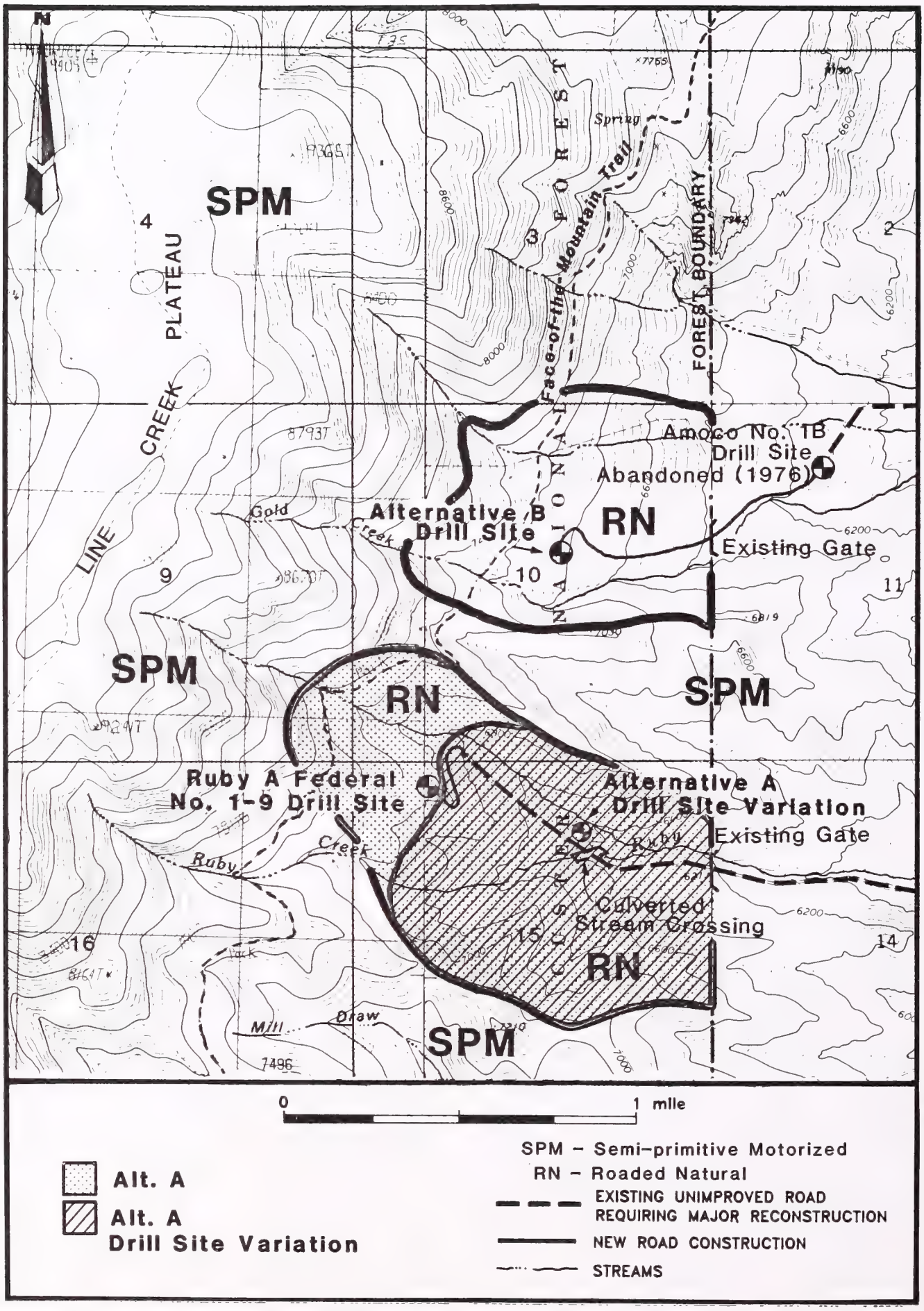

Exhibit 4-1. Redesignation of Recreation Opportunity Spectrum Classes Due to Implementation of Alternative A and B Drill Sites and Access Routes

quality dimensions of the hunting experiences available in the area. As a result, increased dissatisfaction would probably emerge among hunters accustomed to using this area. It is not possible to determine the exact acreage of hunting area in which hunters' experience would be disrupted. However, the area of impact would be no smaller than 970 acres listed for Alternative A in the Visual Resources Section of Chapter 3 (Exhibit 3-11) in which there would be visual access to project facilities. The absence of significant adverse effects on big game populations (see the Wildlife Section) and the ability of hunters to redistribute themselves into areas not immediately adjacent to the project site, suggests that the impacts of exploratory drilling activities on hunting recreation would be minor, even if the exploratory drilling carried over into a second or third project season. If project activities coincided with only one hunting season, impacts involving displacement of hunters and deterioration of recreation experiences would be insignificant.

It is important to note that to some extent the occurrence of significant adverse impacts on recreation opportunities in the project area is an outcome of project scheduling requirements designed to minimize impacts on elk biology and elk populations. Restrictions on project activities during critical periods of elk use in the area could require the exploratory phase of the project to extend over more than one season. Consequently, the imposition of project restrictions designed to protect one important biological and recreation resource (elk populations) results in a more extended period of recreation disruption and displacement than might otherwise occur. Since elk hunting is the most important recreation use of the project area it is reasonable to impose project requirements that protect the long-term viability of that resource, even though the result is an increased likelihood of significant but shorter-term impacts on recreation uses of the area during the period of project activities.

None of the roading variations described in detail in the Transportation Section would result in provision of unrestricted public access to the Forest boundary or onto Forest lands during the period of project activity. Therefore, the four roading variations considered for access to the proposed drill site would not differ in terms of impacts on recreation resources within the National Forest. However, off-Forest impacts on recreation would differ across the access route variations. Route Variation A1 would have the least impact on recreation since it would primarily involve a road corridor that is not presently available for unrestricted public use. In contrast, the A2 route variation would conflict with public recreation uses of both the Meeteetse Trail and Robertson Draw roads, and the A3 and A4 route variations would contribute to conflicts between project vehicle traffic and public use of Robertson Draw Road. The A4 route variation would also involve project vehicle use of some public roads in the extreme southern segments of that route.

4.8.3.2 Alternative A Drill Site Variation

Recreation impacts associated with the Alternative A Drill Site Variation would be similar to those discussed under Alternative A.

The current SPM designation for the area surrounding the drill site would be inconsistent with the level of project activity and the extensive use of motorized equipment that would occur. A redesignation of approximately 380 acres surrounding the project facilities from SPM to RN would be necessary to be consistent with Forest Service ROS guidelines (see Exhibit 4-1). This redesignation would represent less than 20 percent of the SPM acreage in the analysis area and would not be a significant impact. Unless field development were to occur this change in ROS conditions would be temporary.

Implementation of the drill site variation would result in somewhat lower recreation impacts than would occur with the proposed drill site. This would occur in part because the variation drill site would be farther from and less visible to users of the Face-of-the-Mountain Trail. In addition, the location of drilling activities at the variation drill site could slightly reduce impacts on elk (see Section 4.6.3.1.3) and elk hunters who frequent upslope areas nearer to the proposed site. At the same time, implementation of the variation drill site could result in greater impacts on

the private landowners who maintain a seasonal residence adjacent to the access route just outside of the Forest boundary. Both visual and audible impacts of the drilling activities would likely be more intrusive for users of that residence if the alternative site was utilized.

4.8.3.3 Alternative B - Gold Creek Site

Recreation impacts associated with the Gold Creek drill site would be very similar to those related to the proposed action. In general, the magnitude of effects would be somewhat lower at this site, since the drill site facilities and access road would not be as far within the Forest boundary.

The location of the drill site would not be inconsistent with the existing ROS classification of SPNM (summer) on the Line Creek Plateau to the west. Exploratory drilling activity and access road construction, however, would be inconsistent with the current SPM classification of the project area itself. Approximately 300 acres would need to be reclassified from SPM to RN to be entirely consistent with the FS ROS guidelines (see Exhibit 4-1). This is less than the amount of change required for the proposed drill site and represents an insignificant change in the recreation opportunity characteristics of the analysis area. Moreover, this ROS reclassification would not be required for a short-term exploratory drilling program. In the event the drill site is not placed into production (e.g., field development) the area would return to a condition consistent with the SPM classification following site reclamation.

As with the proposed site, exploratory activities at this site could displace limited numbers of recreationists and cause a deterioration of recreation experiences for others. Hikers and others using the Face-of-the-Mountain Trail would see and hear project activities while on trail segments in the area. The area of impact on hunters' recreation experiences would be slightly less than under Alternative A, since the area of visual access to project facilities would be approximately 600 acres compared to 970 acres for Alternative A. Most users, however, could readily relocate to alternative recreation areas nearby. Impacts on hunting would not be as substantial at this site due to the somewhat lower levels of hunting use reported for this project location. Although hunter satisfaction would likely deteriorate somewhat, the ability of hunters to redistribute into surrounding areas and the temporary nature of exploratory activities suggest that impacts on hunting use would be minor even if the drilling continues into a second or third season, as discussed under Alternative A.

4.8.4 Impacts Summary

The analysis indicates that recreation impacts associated with exploratory activities at either the proposed *drill* site, *variation drill site*, or the alternative drill site would be relatively minor. Changes in the recreation opportunity characteristics of *the area surrounding each of the three drill* sites would be limited and would involve insignificant shifts in ROS conditions. Short-term displacement of limited numbers of recreationists would occur at *the drill* sites, as would a deterioration of the recreation experiences available to others who would continue to use the surrounding areas. These impacts, however, would involve relatively few people. The seasonal period designated for drilling activities would interfere with big game hunting, which is the primary recreation use occurring in both locations. However, hunters could generally relocate into nearby areas.

The magnitude of negative effects would be slightly lower at the Gold Creek site. This is due to the slightly lower hunting activity reported for that location and the smaller number of acres that would be affected by activities inconsistent with the current ROS classification. Also, drilling at the *proposed and variation drill* sites would involve road development and project traffic that could interfere with recreational use of the seasonal residence located near the Forest boundary, although the current owner of that cabin has indicated that he is not opposed to the proposed developments. No recreational or other residences are located near to the Gold Creek site.

In addition, the Gold Creek site may provide a more favorable location for enhanced public access to the Forest that would be consistent

with objectives for improved road access set forth in the LRMP, which calls for access to the Forest boundary at approximately five-mile intervals (USDA-FS *1987b*). At present, area land owners have not denied public access to the Forest boundary near the *proposed* Ruby Creek site, which is less than three miles north of existing public access in Robertson Draw. In contrast, general access to Gold Creek has been denied. The potential for improved access at either *of the three drill* sites is uncertain, however, since it would be necessary to obtain a legal right-of-way to provide for public use of route segments crossing private lands.

4.8.5 Cumulative Impacts

Recreation impacts associated with either alternative *and the Alternative A Drill Site Variation* would be of limited magnitude; however, they could combine with potential future resource exploration and development activities in surrounding areas to cause more substantially adverse impacts on recreation resources in the analysis area. Specifically, recreationists have previously expressed concerns about the possible adverse effects of seismic exploration activities on wildlife resources and hunting opportunities in the Beartooth District (USDA-FS 1985). Also, the potential for other petroleum exploration and development activities, including possible future field development linked to this project, is a source of concern among recreation users. Any future seismic activities or other petroleum exploration and development that might occur simultaneously with and in the vicinity of this project could restrict the ability of recreationists to relocate and avoid exposure to project activities. Under such circumstances the proposed project could contribute to cumulative effects involving a deterioration of the recreation resource, although the incremental impacts of this one exploratory well would be small. Appendix B discusses impacts due to field development and indicates that cumulative impacts on recreation could be substantial.

4.8.6 Mitigation Summary

Although the analysis has not identified major recreation impacts, the following mitigation procedures are suggested to reduce the magnitude of adverse effects on recreation in the project area. In addition, impact mitigation procedures specified for wildlife and visual resources would also help to reduce the magnitude of recreation impacts.

- Maintain existing regulations that prevent unauthorized public motorized travel on Forest lands in the analysis area, thereby minimizing the adverse effects of vehicle-related noise and dust on recreation.

- Restrict construction and drilling activities to avoid the rifle hunting season, if these activities continue into a second rifle season.

4.8.7 Unavoidable Adverse Impacts

Even under full implementation of mitigation procedures, there would still be some significant unavoidable adverse impacts on recreation associated with either of the alternative locations for this exploratory drilling activity. These would include displacement of some hunters. However, the number of individuals affected and the duration of such effects would be relatively small.

4.9 SOCIOECONOMICS

4.9.1 Introduction

Nearly all of the socioeconomic impacts of the proposed exploratory well are expected to be indirect and diffused throughout the local populations. There would be few direct socioeconomic impacts because there are few permanent dwellings in the proximity of the proposed drill site. There is a seasonal residence approximately 1.5 miles east of the proposed drill site, but the nearest permanent housing is at a ranch approximately six miles northeast of the site.

4.9.2 Impact Significance Criteria

Social impacts were evaluated on the basis of the following criteria:

- Demographic impacts involving a greater than ten percent increase on a local population, based on the assumption that

such growth could strain the capacity of infrastructure in area communities.

- Any permanent displacement of residents or users of the affected area, identifiable changes in or conflicts with existing ways of life or levels of dissatisfaction likely to generate organizational response and conflict.

The aggregate economic impacts for the proposed development can be disaggregated into separate impacts associated with individual resources. Resources that may involve significant economic impacts are big-game hunting (both guided and non-guided), dispersed summer recreation, timber, and the aggregate local economy. Impacts were defined as significant if they had the following effects:

- An aggregate change in revenue flows likely to produce significant social impact within area communities.

- An aggregate change in non-market values likely to produce significant recreational or social impacts within area communities.

4.9.3 Direct and Indirect Impacts

The socioeconomic impacts would be distributed across Carbon County, Montana, and Park County, Wyoming. All impacts are likely to be more pronounced in Carbon County than in Park County. Several factors support this conclusion:

1. The larger population in Park County could more easily assimilate any population changes associated with the proposal.

2. A larger proportion of Park County's economy is based on mineral and energy exploration, development and production, which tends to make the population more comfortable with energy developments than it otherwise would be.

3. A substantial proportion of oil rig and other workers would come from Cody, but since the Cody area labor force already contains substantial numbers of oil and gas industry workers, there would be little likelihood of significant in-migration of new residents.

4. There is little recreation use in the analysis area by Park County residents because there are comparable recreational opportunities in Wyoming and because Wyoming residents using the area for hunting would have to pay the higher Montana non-resident hunting fees.

The remainder of this discussion will therefore concentrate on Carbon County since this county would be more sensitive to decisions made on this proposal than would be the case in Park County. Thus, if an alternative has no significant impact on Carbon County, presumably the impact on Park County would also be insignificant. In addition, if a remedial measure could mitigate the significance of an impact in Carbon County, it would probably have equal success in Park County.

4.9.3.1 Alternative A - Proposed Action

Drilling and construction activities associated with this alternative would have modest and generally insignificant impacts on the socioeconomic environment in Carbon County. Social impacts could arise in part as a result of population increases caused by in-migration and disruption of existing lifestyles. However, the number of people working on the project at any one time would be less than twenty. Some of the people who would work on construction of the road and pad, or on the drilling itself, may already live in the area. The additional workers would probably relocate temporarily, and would often not bring their families. Even if there was more permanent in-migration caused by the project, the housing supply, schools, and other portions of the public infrastructure in Carbon and Park counties could accommodate the additional demand likely to result from the exploratory drilling proposal.

Some local residents who oppose petroleum exploration and development in this area could experience increased dissatisfaction with environmental conditions and with decision makers responsible for public land management. In addition, the lifestyles of some residents living near to access route corridors could be altered, due to the

introduction of increased road use and activity in an area currently characterized by relative isolation and a secluded rural lifestyle. For example, residents of the Anderson ranch near the beginning point of access Variations A1 and A2 would experience increased noise, dust and traffic levels that could force some shifts in established behavior patterns. Similar effects could be experienced by a somewhat larger number of residents living near to the A4 road corridor.

For the project area, the economic impact can be divided into three categories: tax revenues, community revenues, and non-market benefits. The tax revenues come from the property tax levied against the taxable value of the drill rig and the associated equipment when the equipment is in Carbon County. The community revenues are estimates of the monetary inflows that would result from the proposed action. No multipliers are used in calculating community revenues because the objective is to show financial impacts to, rather than movements through, the area. The non-market values included in the analysis are hunting/fishing and all other recreation. Other non-market outputs potentially available from the area include forage and water. The range potential on FS lands is currently not captured because no grazing is permitted on FS lands in the project area. Similarly, as indicated in the Vegetation Section, the forage loss due to road improvement on BLM lands would be negligible. There is no data on the use or value of water coming from Ruby Creek. This incomplete data makes a definitive estimation of present net value or benefit-cost ratios impossible. As such, neither have been provided.

Table 4-4 summarizes the economic impact resulting from the proposal. The No Action Alternative produces no tax or community revenues but provides the highest level of non-priced benefits. Both the proposed drill site (Ruby Creek) *(including the Alternative A Drill Site Variation)* and the alternative *drill* site (Gold Creek) result in reduced non-priced values because the level of recreation, attractiveness, and use of the project area would diminish during the proposed project. The action alternatives produce tax and community revenues that the No Action Alternative does not.

Tables 4-5 through 4-7 show the details of the economic impact calculations that are summarized in Table 4-4. Table 4-5 shows the detailed costs of the project by category and estimates the level of resulting community resources. Table 4-6 shows the costs of the different Alternative A roading variations and of Alternative B. The Alternative A costs are sufficiently similar that the road chosen will not significantly affect the economic impact of the proposal. Both Tables 4-4 and 4-5 are based on the road costs for Phillips' proposed access route (Variation A1).

Monetary impact calculations are based on non-market value or recreation value changes resulting from the proposed project. These changes would result from either lost recreational use or diminished quality of remaining recreational activities in the project area. This measure of recreational value is not merely recreation expenditures or license fees, but is based on the more comprehensive concept of willingness-to-pay.

Table 4-7 shows the derivation of the recreation values and assumes that the recreation use drops by 30 percent the first two years and by ten percent in the third year. The sources of recreation value changes or losses include: 1) reduced recreation use in the immediate project area, 2) reduced willingness-to-pay for the remaining use in the project area, and 3) reduced willingness to-pay for recreation at other sites that experience higher use levels because of recreationists displaced from the project area. This approach is based on the hypothesis that even though the use may be eliminated from the immediate area during project implementation, most of the use would be displaced rather than eliminated entirely.

Table 4-4 shows that despite the loss in non-priced benefits, both of the action alternatives produce substantial tax and community revenues. The tax revenues alone are estimated to be over 25 times larger than the value of the recreation losses for either action alternative. From a strictly financial perspective, the proposed action would likely have a substantial net positive impact. This conclusion ignores distributional issues that may arise because some individuals may be negatively impacted but do not share in the

Table 4-4. Economic Impacts[a] Due to Alternative A, Alternative B, and No Action Alternative.

	No Action	Alternative A[b]	Alternative B
	$1000	$1000	$1000
Property Tax Revenues	0	141	141
Revenues to Community			
Drilling Crew Wages	0	96-119	102-128
Site/Road Construction and Reclamation	0	200-250	200-250
Mobilization	0	15-20	15-20
Other	0	50-116	51-119
Non-priced Values			
Hunting	66.4	64.8	64.8
Other Recreation	52.5	51.1	51.1

a - Assumptions: Ten year analysis period; four percent discount rate; all recreation down 30% the first and second years; all recreation down 10% the third year, follows Custer Forest Plan in subsequent years.

b - These values would be very similar for the Alternative A Drill Site Variation.

Source: Summary of Tables 4-5 through 4-7

Table 4-5. Estimated Community Revenue Impacts by Alternative.

Community Revenue	Alternative A[a] Cost ($)	Alternative A[a] Ecomonic Impact ($)	Alternative B Cost ($)	Alternative B Ecomonic Impact ($)	Percent of Revenues Remaining in Community
Rig Costs					
Rig Hardware	$ 953,175	0	$ 952,650	0	0
Crew Wages	477,400	95,480-119,350	511,500	102,300-127,875	20-25
Construction and Reclamation of Site and Road	1,000,000	200,000-250,000	1,000,000	200,000-250,000	20-25
Mobilization	100,000	15,000- 20,000	100,000	15,000- 20,000	15-20
Drilling Tangibles[b]	538,000	0	551,000	0	0
Directional Drilling	600,000	0	630,000	0	0
Other Unspecified Intangibles	1,653,000	49,590-115,710	1,701,000	51,030-119,070	3-7

a - These values would be very similar for the Alternative A Drill Site Variation.

b - Casings, tubings, etc.

Source: Phillips Petroleum 1988

Table 4-6. Cost of Roading Alternatives and Variations.

Road Variation	Miles of Road	Estimated Costs ($)
Alternative A		
A1	14.1	30,900
A2	22.9	46,500
A3*	13.2	199,100
A4	18.0	39,000
Drill Site Variation	13.4	25,200
Alternative B	11.2	27,600

* - includes the cost of bridge reconstruction

Table 4-7. Recreation Value Calculations.

Recreation Use Rates for Line Creek Analysis Area (RVD/acre)

	Hunting and Fishing	Other Recreation
First 5-year period	0.24	0.25
Second 5-year period	0.27	0.29
Third 5-year period	0.29	0.33
Fourth 5-year period	0.32	0.38
Fifth 5-year period	0.35	0.42

Values per RVD (1978 dollars):

Hunting and Fishing	$2.75/RVD
Other Recreation	$3.66/RVD

Recreation Value[a] by Alternative

Year	No Action	Alternative A[b]	Alternative B
1	$3396:4331	$2377:3054	$2377:3054
2	3396:4331	2377:3054	2377:3054
3	3396:4331	3056:3926	3056:3926
4	3396:3441	3396:3441	3396:4331
5	3396:3441	3396:3441	3396:3441
6	3911:4908	3911:4908	3911:4908
7	3911:4908	3911:4908	3911:4907
8	3911:4908	3911:4908	3911:4908
9	3911:4908	3911:4908	3911:4908
10	3911:4908	3911:4908	3911:4908
Discounted @4% and inflated using the CPI	52456:66386	50172:63578	50178:63578

a - Values are presented as ratios; Hunting and Fishing : Other Recreation.

b - These values would be the same for the Alternative A Drill Site Variation.

Source: Logan 1988

economic benefits. This conclusion also ignores the non-pecuniary aspects of the social environment.

Socioeconomic impacts caused by implementation of the Alternative A Drill Site Variation would be nearly identical to implementation of the proposed drill site. Implementation of the variation drill site would cost approximately $5,700 less than the proposed site. This difference cannot be resolved in the scope of this level of analysis.

4.9.3.2 Alternative B - Gold Creek Site

The social and economic impacts of the Gold Creek drill site and access road would be virtually indistinguishable from those arising from the proposed alternative. Substantial positive net economic benefit would result, regardless of the eventual productivity of the well. Losses to non-market values would be minimal and temporary. In-migration would be slight and no meaningful decrease in the overall satisfaction levels of local populations is expected.

4.9.4 Impacts Summary

Every indication is that any negative socioeconomic impacts resulting from either the proposed or alternative actions would be minimal. Some individuals, such as hunters, hunting outfitters, and the few residents living adjacent to the various alternative access routes may be adversely affected. Additional people may feel that the economic future of the area lies not in extractive industries but in recreation/tourism. Nevertheless, the negative economic impacts are a minimal loss of recreation benefits, and these are offset in aggregate by property taxes and a substantial increase in community revenue flows.

4.9.5 Cumulative Impacts

The proposed project would not significantly add to cumulative economic and social impacts in the region. Appendix B discusses impacts due to field development and indicates that cumulative socioeconomic impacts would be positive due to increased county, state, and federal revenues.

4.9.6 Mitigation Summary

Since no significant impacts are expected, no mitigation would be required.

4.9.7 Unavoidable Adverse Impacts

No unavoidable adverse impacts would occur to socioeconomics due to implementation of either alternative.

4.10 CULTURAL RESOURCES

4.10.1 Introduction

Cultural resources on public lands, including archeological sites and historic properties, are protected by various laws and regulations dating as far back as the Antiquities Act of 1906. The specific directives can be found in "Archeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines" (Federal Register 1983). Archeological sites and historic properties are evaluated based upon their eligibility for the National Register of Historic Places. Legislation has created a screening process that provides for protection of only the most significant sites. Protection for sites can only be assured if the sites meet eligibility requirements for the National Register.

National Register criteria (36 CFR 60.4) define four categories of significance based upon "the quality of significance in American history, architecture, archeology, and culture present in districts, sites, buildings, structures and objects of state and local importance that possess integrity of location, design, setting, materials, workmanship, feeling, and association; and that:

- o are associated with events that have made a significant contribution to the broad patterns of our history; or
- o are associated with the lives of persons significant in our past; or
- o embody the distinctive characteristics of a type, period, or method of con-struction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable

entity whose components may lack individual distinction; or

- have yielded, or may be likely to yield, information important in prehistory or history."

Specific criteria are developed by the State Historic Preservation Office (SHPO) in consultation with the Federal management agencies. Applicants for Federal permits consult the applicable SHPO to determine the presence of known resources or the need for additional surveys. This consultation shall lead the applicant to develop a cultural resource management plan which outlines procedures to identify, evaluate, and protect or mitigate adverse effects to National Register and eligible sites and properties. Such plans may be implicit for small projects but must be formalized in areas of major impact. The plans will follow regulations established by the Advisory Council on Historic Preservation (51 CFR 31115, 1986).

Sites are generally not eligible for the National Register of Historic Places if they lack diagnostic artifacts, subsurface remains, or structural features. Sites that cannot be placed in a temporal context or related to other sites are usually not eligible and therefore cannot officially be protected. Much of the Forest land has not been adequately surveyed, and sites lacking the criteria of context may eventually become important if related to other sites that have not yet been discovered. Any archeological resource discovered on National Forest lands has an unknown significance if discovered in an area where little previous survey has been performed. Sites should be considered potentially eligible unless evidence to the contrary is overwhelming.

4.10.2 Impact Significance Criteria

The Advisory Council on Historic Preservation has developed guidelines for determining adverse impact for any site on or eligible for nomination to the National Register of Historic Places [36 CFR 800.9 (b)(1),(2),(3)].

Significant impacts to Cultural Resources consist of the following:

1. Destruction or alteration of all or part of a property.

2. Isolation of a cultural resource from or alteration of its surrounding environment.

3. Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting.

4. Neglect and subsequent deterioration.

These adverse effects could be in the form of direct, indirect, or cumulative impacts. Direct impacts are physical, and adversely affect the site or its setting. Construction activities would be the primary direct impact affecting sites or structures. Indirect effects would not immediately result in physical alteration of the site or its setting. A new access road into an area containing significant sites or structures would allow public access and exposure of the properties. Artifact collection or similar activities could physically alter the site. If such activities were sporadic, their effects over a period of time would be cumulative. Gauging the effect of any impact depends on the level of information available from the inventory. If cultural resources on or eligible for the National Register of Historic Places are to be adversely impacted by the proposed project, then the applicant, in consultation with the SHPO and the surface management agency, shall develop a mitigation plan. Construction would not proceed until terms of the mitigation plan are satisfied.

4.10.3 Direct and Indirect Impacts

4.10.3.1 Alternative A - Proposed Action

A files search of the Montana State Historic Preservation Office revealed that there are no sites on or eligible for the National Register of Historic Places in the project area on Forest lands. A Class III walkover archeological survey of the drill sites and access routes on Forest land did not identify any cultural resources. Cultural resources would not be directly impacted in the project area on Forest lands. Secondary effects from the construction of the access road and drill site could include adverse impacts to presently

undiscovered sites or properties in areas near the proposed action. There is no evidence to suggest that the area has religious significance to existing Native Americans.

A Class III pedestrian archeological survey was performed on 13 miles of access road corridors associated with the access route variations. Existing improved roads (Variation A4 to the Wyoming state line) were not surveyed because of the minimal amount of maintenance needed to make them serviceable for the drilling activities.

Six properties were either located or re-visited during the course of the survey. Sites RC-1, 2, 3, site 24-CB-38, and site 24-CB-622 (Exhibit 4-2) are all recommended for nomination to the National Register of Historic Places under Criteria D, i.e., they are likely to yield information important in prehistory or history. Further research may reveal that the sites are eligible under other criteria as well.

Site RC-1 is the Meeteetse Trail (also the Billings to Meeteetse Stage Trail). This trail was constructed primarily in 1881 by the U.S. Army as a stage and freight road that headed south from Billings to Red Lodge, Montana and continued southerly to Meeteetse, Wyoming. The Red Lodge to Meeteetse stretch was approximately 100 miles long. This was the first road for conveying mail, settlers, and material culture in the Upper Big Horn Basin. The trail may, therefore, also be eligible for the National Register under Criteria A, i.e., it is associated with events that have made a significant contribution to the broad patterns of our history. Access route variations A2 and A3 and Alternative B would cross the trail in areas where its integrity is poor, which would minimize any adverse effect and would allow the "documentation of eligibility" to serve as a mitigative measure. Variation A4 would not impact the trail.

Site RC-2 is the Dilworth Post Office, Tolman Cemetery, and Corral. This complex may be eligible for the National Register under Criteria C because it "represents a significant and distinguishable entity whose components may lack individual distinction." Only Variation A1 would potentially affect this complex.

Site 24-CB-38 is a prehistoric drive alignment site. Associated with the drive alignment is a large cairn which was modified to serve as a Vision Quest structure. A projectile point recovered in association with the drive alignment indicates the site dates to the Late Period (1200 to 200 B.P.). Only Variation A1 would affect this site.

Sites RC-3 and 24-CB-622 are extensive stone circle sites. Some of the circles have interior hearths and possible storage pits associated with them. Very few artifacts are associated with either site, but projectile point fragments indicate that the sites date from Late Period (1200 to 200 B.P.). These sites may also be eligible for the National Register under Criteria C. Both of these sites have been adversely impacted by road and fence construction to a small degree. Site RC-3 would be impacted by access roads for Alternative B. Site 24-CB-622 would be impacted by access roads for Alternative A.

4.10.3.2 Alternative B - Gold Creek Site

The discussion presented under Alternative A also applies to this alternative.

4.10.4 Impacts Summary

All access route variations would affect cultural resources. Site RC-3 would be impacted by access roads for Alternative B. Site 24-CB-622 would be impacted by Alternative A access roads. Variation A1 would adversely impact the Meeteetse Trail and the Dilworth Post Office Complex and drive alignment which have been evaluated and are recommended for nomination to the National Register of Historic Places. The use of access route variation A1 would constitute an adverse effect to the complex because it would cause "isolation from or alteration of its surrounding environment and would introduce visual, audible, or atmospheric elements that are out of character with the property and alter its setting." None of the other access road alternatives would have any effect upon the property. Because the level of impact to cultural resources is much greater with the A1 routing variation than any of the other variations, it is recommended that Variation A1 be discarded as a potential access road.

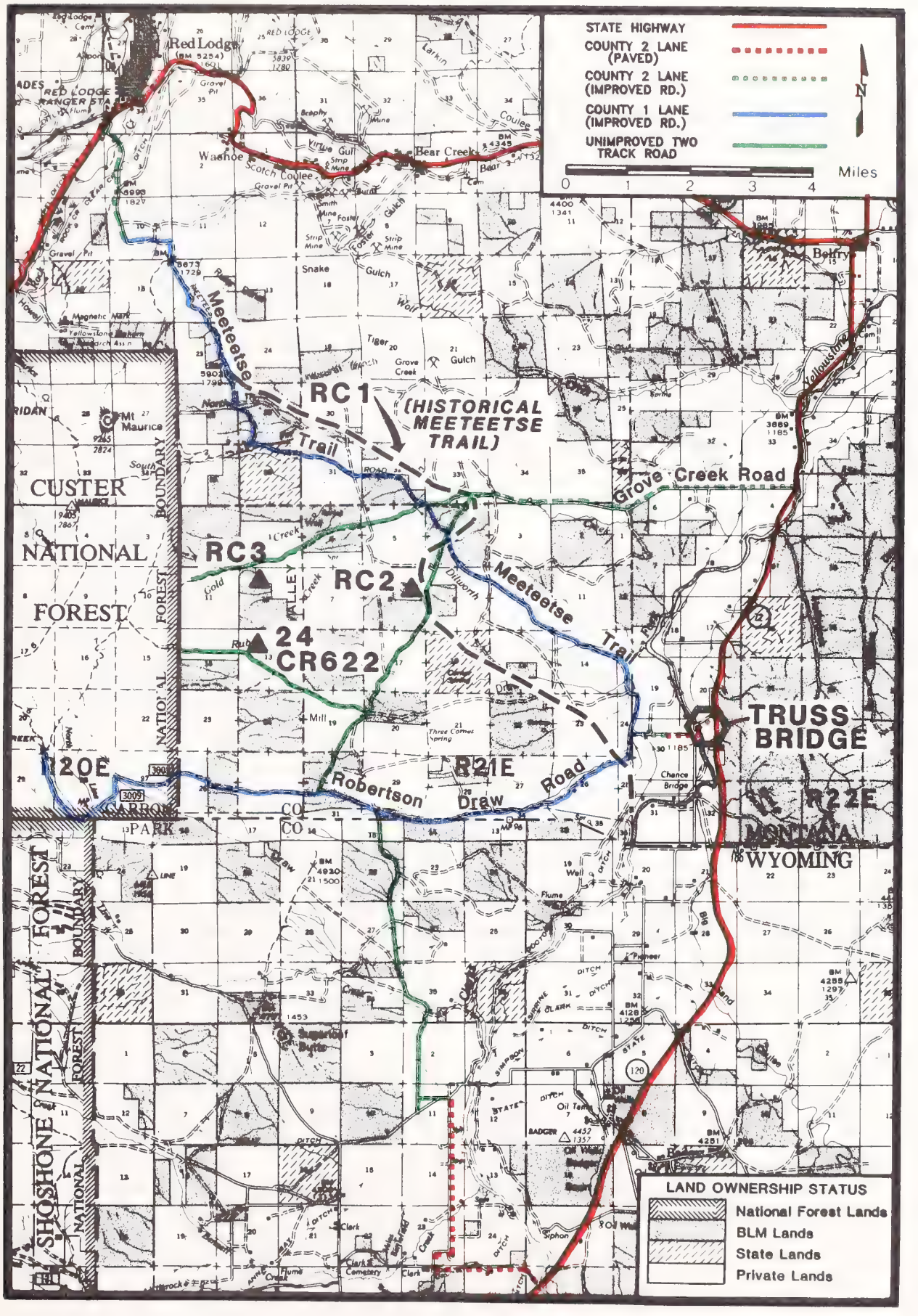

Exhibit 4-2. Location of Cultural Resource Sites Along Project Components.

Variations A2, A3, and A4 would impact the Meeteetse Trail and stone circle site 24-CB-622. Impacts to both sites would be minor because in this area, the Meeteetse Trail has been modified by modern vehicular travel and these variations avoid the main stone circle concentration at site 24-CB-622.

The access road to Alternative B (Gold Creek) would impact the Meeteetse Trail and stone circle site RC-3. Impacts to the Meeteetse Trail would be minor. Major impacts would occur through the center of RC-3. Because of the level of impact to cultural resources associated with road construction and reconstruction, it is recommended that Alternative B be discarded.

4.10.5 Cumulative Impacts

Disturbance and/or loss of other unidentified sites or artifacts could add to the cumulative loss of information about our heritage in the project area and in the region if these sites or resources are not identified and inventoried prior to disturbance. Appendix B discusses impacts due to field development. Any loss of or damage to unidentified cultural sites or resources associated with the proposed action combined with similar losses or damage due to field development could be substantial. The implementation of the Class III Pedestrian Surveys on the drill site alternatives and access route variations has minimized the potential for cumulative impacts to cultural resources in the analysis area. Variations A2, A3, and A4 have the least cumulative impacts to cultural resources.

4.10.6 Mitigation Summary

Mitigation measures would be required for all the access route alternatives. Variation A1 would require the maximum mitigation. Detailed datum-based mapping and excavation would be required at the Dilworth Post Office and drive alignment site 24-CB-38. The route of the Meeteetse Trail would require survey mapping and photographic documentation.

Alternative B would require detailed datum-based mapping of stone circle site RC-3. Stone circle features and intervening ring exterior areas would require excavation through the site keyed to the surveyed road route. Survey and photographic documentation of the Meeteetse Trail would also be required.

Alternative Variations A2, A3, and A4 would require detailed datum-based mapping and excavation of stone circle site 24-CB-622. The location of this site provides for a greater likelihood of the avoidance of stone circle features and less necessary excavation. Selection of Variation A3 would require the analysis of the potential National Register significance of the truss bridge crossing the Clarks Fork River.

4.10.7 Unavoidable Adverse Impacts

Even with the application of mitigative measures, affects to cultural resources would constitute adverse impacts. These impacts would be major should access route Variation A1 or Alternative B be chosen. With Variations A2, A3, and A4 adverse impacts would be minimized if not avoided. Implementation of Class III Pedestrian Surveys of all areas has reduced the potential for impact to cultural resources to low levels should the proposed action (Alternative A) be selected.

4.11 HEALTH AND SAFETY

4.11.1 Introduction

Potential risks associated with implementation of the proposed project include the following: the normal risks associated with traffic, heavy construction, and the drilling operations, and the risks of exposure to hydrogen sulfide (H_2S) gas.

4.11.2 Impact Significance Criteria

The following are the impact significance criteria for Health and Safety:

- Presence of concentrations of hydrogen sulfide concentration that would cause discomfort and that might be lethal to certain sensitive individuals (e.g., the very old, very young, or infirm); H_2S concentration levels that would cause eye irritation, loss of smell, and possible coughing; and instantaneous H_2S concentrations of 1,000

parts/million (almost always lethal to humans).

- Increased risk to the public from project implementation beyond those to which people are exposed in everyday activities.

4.11.3 Direct and Indirect Impacts

There is a possibility of encountering H_2S in the Phosphoria, Tensleep, and Madison Formations. Phillips has anticipated this probability and has prepared an H_2S Contingency Plan that addresses the accidental release of H_2S during drilling (Appendix E). The purpose of this plan is to safeguard the lives of the public, contract personnel, and company personnel in the event of equipment failures or disaster during drilling or completion operations in formations that may contain H_2S gas. This plan also specifically addresses methods to minimize hazard to any residences in the project area, specifically the summer home near the mouth of Ruby Creek canyon. All required safety equipment and training have been provided for in this plan and the drilling program submitted with the APD. Since Phillips recognizes the potential for emission of H_2S and plans to implement state-of-the-art contingency plans, significant impacts to public heath and safety as a result of drilling at either of the proposed drill site alternatives is unlikely.

Should producible quantities of oil and/or gas be encountered, the drill site should be secured to prevent the public from exposure to hazardous conditions during the interim period while a decision regarding development is made by the FS and BLM. This could include fencing the site to preclude unauthorized access.

Implementing either of the alternatives or variations (A2, A3, and A4) as defined in the Transportation Sections of Chapters 3 and 4 would increase traffic along existing access roads to the drill site. The magnitude of impacts could be greater for Variations A2, A3, and A4 than for Variation A1 since heavy truck traffic would increase on existing roads used by farmers, ranchers, and recreationists who are unaccustomed to such use. By use of such precautions as escort vehicles, gate guards, warning signs, and intervisible turnouts, however, the risk of vehicular accidents and injury to the public would not increase significantly over existing levels currently found in the analysis area; therefore, no significant impacts are expected to occur under any alternative or variation.

The public could be exposed to the hazards of heavy construction associated with either of the drill site alternatives; however, the use of gate guards, warning signs, and public information programs would minimize the risk of public exposure to these hazards to levels not considered significant. Through implementation of best management practices, the Contingency and Evacuation Plan (Appendix E), and additional mitigation measures, the project should incur no indirect impacts to health and safety.

4.11.4 Impacts Summary

Based on the significance criteria presented previously, *none of the drill sites* are expected to have significant direct or indirect impacts from hydrogen sulfide exposure to Phillips' personnel, hunters, or other recreationists or from the increase in vehicular traffic, provided standard operating precautions and applicable mitigation measures are followed. Although the potential for exposing the public to harmful levels of H_2S is low, as previously discussed, there is a summer residence directly down drainage and within one mile of the Ruby Creek drill site. *The Alternative A Drill Site Variation is within 0.5 miles of the same summer residence as discussed for the Ruby Creek drill site.* If harmful levels of H_2S were to be emitted, this residence could be exposed to the gas. *Due to a closer proximity to the residence, a higher risk of exposure to H_2S by residents would occur with implementation of the drill site variation when compared to the proposed drill site.* In contrast, the nearest residence down drainage from the Gold Creek site is approximately three miles distant. Therefore, the Gold Creek site would be slightly preferable to the Ruby Creek sites. Users of the Face-of-the-Mountain Trail could be affected at either site as the trail passes within 200 yards.

4.11.5 Cumulative Impacts

Because the probability of significant risk to public health and safety resulting from implementation is considered to be low, no significant cumulative impacts are expected to occur. Appendix B discusses potential impacts due to field development. No significant cumulative impacts associated with both the exploratory drill site and field development are expected to occur.

4.11.6 Mitigation Summary

In conjunction with the implementation of the H_2S Contingency Plan presented in Appendix E (Phillips' operational safety policies and procedures), additional measures to reduce potential public health and safety hazard in the project area. These measures include erecting warning signs for both heavy truck traffic as well as the potential of H_2S gas at strategic points of access, publish a notice in the local newspapers alerting the public of any changes in the H_2S status during drilling, as well as additional measures presented for Transportation. These measures are presented in greater detail in Chapter 5.

4.11.7 Unavoidable Adverse Impacts

No unavoidable adverse impacts to public health and safety are expected to result from project implementation.

4.12 NO ACTION ALTERNATIVE

4.12.1 Introduction

As required by Section 1502.14(d) of the National Environmental Policy Act (NEPA), the consequences of "No Action" must be analyzed. Because of the inherent legal conditions associated with the oil and gas leases involved with this drilling proposal, three possibilities exist for No Action. These are: 1) No Action - Unconstrained, 2) No Action - As Authorized by the Secretary of the Interior, and 3) No Action - As Authorized by Congress. The conditions under which No Action can be considered are constrained by the level at which the authority exists to deny activity upon the lease, and by the terms of the lease. None of the stipulations, however, give the Secretary of the Interior the authority to deny all drilling activity because of environmental concerns. The denial of all activity on the lease may require Congressional action. The No Action possibilities and associated consequences are explained in the following sections.

4.12.2 No Action - Unconstrained

"No Action" in the strictest sense of the word would essentially leave the condition of the existing environment as is. Certain existing activities pursued by humans have created an altered environment with associated impacts above those of an area totally untouched by human activity. Consequently, implementation of the No Action Alternative would maintain the current level of human activity and associated impacts as described in each respective resource section of Chapter 3 and the Cumulative Impacts section of each resource discipline in Chapter 4.

4.12.3 No Action - As Authorized by the Secretary of the Interior

The lease(s) contain special stipulations that enable the Department of the Interior, in consultation with the Department of Agriculture, to ensure protection of sensitive resource values before approving any surface disturbing activity. Two situations exist under which the Secretary of the Interior has the authority to impose No Action:

1. If any one of the special stipulations (Appendix A - Lease Stipulations) could not be acceptably mitigated for any one alternative, then an exception to the stipulation could not be granted. This would require denial of the APD and consideration and analysis of another alternative(s). Consequently, the impacts of "No Action" under these conditions would mean a delay in the leaseholders right to develop their lease, which would mean that drilling would still be allowed at some location on the lease, with reasonable mitigation measures.

2. The Secretary of the Interior has the power to deny activity when such activity would "detrimentally affect" an endangered or threatened species. The

lease stipulation that provides for this reads as follows:

"The USFS is responsible for assuring that the area to be disturbed is examined, prior to undertaking any ground disturbing activities on lands covered by this lease to determine effects upon any plant or animal species listed or proposed for listing as endangered or threatened species, some restrictions to the operator's plans or even disallowances of use may result."

If the U.S. Fish and Wildlife Service's Biological Opinion concluded that the proposed action and alternatives would likely jeopardize the continued existence of an endangered or threatened plant or animal species or their habitat, then the APD may be denied in part or in whole.

If, after consultation with the FWS there is a determination that impacts to endangered or threatened species or their habitat would occur in part of the area, the impact of "No Action" would mean a delay in the leaseholders right to develop their lease. No Action would also mean that drilling would still be allowed at some location within the lease, with reasonable mitigation measures, where endangered or threatened species would not be affected.

If the impact to endangered or threatened species would occur regardless of where the activity took place, then the lease rights may be denied. The leaseholders (lessees) would be denied the right to develop their leases because, "the Department is required by 16 U.S.C., S 1536(a)(2)(1982) to assure any action authorized by it is not likely to jeopardize the continued existence of the threatened or endangered species, or result in the adverse modification of the critical habitat of such species. . .;" and as the Interior Board of Land Appeals found, ". . . the regulation must be construed to authorize the Department to bar surface disturbing activity which would have an impact the Department is not legally permitted to authorize [(Sierra Club Legal Defense Fund, Inc., 84 IBLA 311, 92 I.D. 37 (1985)]. [(Glacier-Two Medicine Alliance et al., 88 IBLA 135 & 146, (85-445)].

The impacts of "No Action" under these conditions (action detrimentally affects endangered or threatened species), therefore, may preclude the leaseholders from developing all or part of their lease. If the APD is denied, the social and environmental impacts identified for the Proposed Action and Alternatives would not occur. Other impacts, however, would include the following:

- The purpose of the production development would not be fulfilled, nor would the potential for contributing domestic oil to reduce the national dependance on foreign supplies.

- All leaseholders would be adversely affected equally. Denial would create an undetermined financial burden on the leaseholders.

- Such lease cancellation may require that just compensation be paid to the lessees, since the lease is viewed as property. This would create an undetermined financial burden on the U.S. government directly and the private taxpayer indirectly.

4.12.4 No Action - As Authorized by Congress

As explained in Chapter 2 and as stated by the Department of the Interior Regional Solicitor, the Secretary of the Interior does not have the power to deny APDs strictly on environmental grounds, absent specific stipulations in the lease [(Solicitors Opinion M-36910 (Supp.), The BLM Wilderness Review and Valid Existing Rights 88 I.D. 909 October 5, 1981)]. Generally, drilling must be allowed at some location on the lease, with reasonable mitigation measures.

Generally, without congressional authorization, the Secretary could only suspend the lease pursuant to Section 39 of the Mineral Leasing Act, pending consideration by the Congress of the grant of authority to preclude drilling and provide compensation to the lessees.

The impacts of this Alternative would be the same as described above, No Action - under conditions where the action may detrimentally

affect endangered or threatened species. In addition, the following impact would also occur:

- Leaseholders (lessees) would be denied their legal rights for development of their various leases. The first premise of federal oil and gas leases, under the Minerals Leasing Act of 1920 as amended, is that the oil and gas lease between the U.S. Government (lessor) and lessee constitutes an contractual agreement which identifies rights and restrictions, subject to relevant laws and regulations. This is supported by the Department of the Interior. In these particular instances, a blanket denial of APDs (as under this alternative) would constitute a cancellation of the leases, and therefore a breach of contract not within the powers of the Secretary of the Interior. Such lease cancellation may require that just compensation be paid to the lessees, since the lease is viewed as property. This would create an undetermined financial burden on the U.S. Government directly, and the private taxpayer indirectly.

4.13 COMPARATIVE ANALYSIS OF PROPOSED ACTION AND ALTERNATIVES

A comparison of significant environmental impacts that may occur as a result of implementing the proposed action (Alternative A) *including the routing variations (A1, A2, A3, and A4) and the variation drill site,* or Alternative B is presented in the following discussion and in Table 4-8. Significant impacts were determined on the basis of impact significant criteria developed for each resource, including whether the action would violate existing management direction contained in the LRMP or in the Billings Resource Area Resource Management Plan (RMP).

4.13.1 Air Quality

Possible impacts could include suspended particulate matter from construction activities, combustion emissions from construction machinery, and accidental emissions of pollutants such as hydrogen sulfide or sulfur dioxide during exploratory drilling activities. No significant impacts would occur, however, with implementation of appropriate prevention and safety measures. There would be no difference in the level of impact between Alternative A, Alternative A routing variations, *Alternative A Drill Site Variation* and Alternative B. The proposed project would not violate existing management direction in regard to air quality.

4.13.2 Transportation

No significant impact would occur due to implementation of *Alternative A, including routing variations (A1, A2, A3, and A4) and the variation drill site, or* Alternative *B*. The level of impact associated with both alternatives would be the same. Of the Alternative A route variations, Phillips' proposed access (A1) would impose the smallest impact on existing *county* road users and would cost the least to construct. Total expenditures for each access route variation and alternative would disproportionately benefit the existing public transportation system in the project area. Access route Variations A2 and A3 would benefit the existing transportation system the most unless public access right-of-ways were obtained by the FS and BLM for Variation A1 or Alternative B. *As indicated in Table 4-1, Variation A4 would involve the greatest increase in improved road followed by A1, A2, and A3. Alternative B would involve the least increase in improved road. Overall, Alternative B would involve the least amount of access road followed by variation A3, A1, A4, and A2 with the most. Implementation of the Alternative A Drill Site Variation would reduce overall road construction costs associated with each access route variation.* The permitted access route would determine the major access in the project area as the road would likely be maintained for use in the future. The proposed project would not violate existing management direction in regard to transportation.

4.13.3 Geology/Soils

No significant impact to the geologic environment would occur under *Alternative A including access route variations and drill site variation, and* Alternative *B. Drilling the well*

from the proposed drill site would provide the best opportunity for approaching the target geologic structure in a manner that would allow for optimal structure characterization and testing. Both Alternative A Drill Site Variation and Alternative B drill sites are offset to the east and at lower elevations than the proposed site which reduces the potential of attaining the goals of the project as discussed in Section 2.2.2.6 and Appendix G.

Soil impacts would primarily relate to increased soil erosion, reduction in topsoil productivity, reclamation feasibility, and road construction across sideslopes in excess of 40 percent with moderate stability hazard. The low fertility and high coarse fragment soils in the project area cause poor reclamation potentials. With aggressive reclamation, including erosion control, selective topsoil handling, and implementation of a fertilization program, soil productivity could be maintained, erosion reduced to near predisturbance condition, and successful reclamation attained, thereby mitigating significant impacts.

Important impact contrasts between Alternative A and Alternative B include 25.3 acres of disturbance with poor or fair reclamation potential for Alternative A compared to 20.3 acres for Alternative B, 800 feet of new road construction across *50-60 percent* sideslopes with moderate slope stability hazard under Alternative A compared to none for Alternative B, encroachment on a 70 percent sideslope down to Gold Creek along Alternative B compared to few boulders for Alternative A, and 0.9 miles of new road construction (4.4 acres) and 3.0-acre drill site requiring special handling of numerous large boulders along Alternative B compared to few boulders for Alternative A. Alternative A would require bench cut, end haul, and stock pile construction across the 800-foot steep sideslope to achieve successful reclamation. In contrast, Alternative B would require a total of 7.4 acres of disturbance requiring selective handling of large boulders (drill site and new access road). Although successful reclamation is attainable for both alternatives, selective handling of large boulders to salvage sufficient quantities of topsoil would be more challenging and costly than special construction with Alternative A. The probability of successfully reclaiming Alternative A, therefore, would be higher than for Alternative B. Of the Alternative A routing variations, implementation of Variation A3 would cause the least impact (15.5 acres), followed by A2 (18.0 acres), A1 (22.8 acres), and A4 (23.8 acres). *Implementation of the Alternative A Drill Site Variation would involve improved reclamation potential, reduced soil disturbance, and less instability problems when compared to implementation of the proposed drill site; however, the reduced level of impact would not be substantial.* The proposed project would not violate existing management direction in regard to geology and soils.

4.13.4 Water Resources

Construction and operation of access roads adjacent to the stream environment is unlikely to cause increased erosion and subsequent sedimentation in Ruby and Gold creeks since runoff and erosion would be controlled on all disturbed areas. Contamination of surface water by spilled fuel or drilling fluid, and contamination of Table 4-8. Comparative Impact Analysis for Alternative A and Alternative B freshwater aquifers by drilling fluids or mixing of groundwater are unlikely to occur since a spill prevention and control plan as well as state-of-the-art drilling techniques would be implemented to minimize these potential impacts. Fisheries would not be impacted since neither Ruby nor Gold creeks contain suitable habitat. Existing water rights and claims in the project area would not be impacted.

Alternative A including access route variations and the variation drill site and Alternative B would involve crossing small perennial streams at existing crossings. Important impact contrasts between Alternative A and Alternative B include 0.02 acres of road construction within the stream environment for Alternative A compared to 0.03 for Alternative B and 1.2 miles of road construction paralleling, but out of, the stream environment for Alternative A compared to 0.4 miles for Alternative B. Alternative B access route converges on a steep 70 percent sideslope down to Gold Creek that could involve fill reaching the stream. To

Table 4-8. Comparative Impact Analysis for Alternative A, Alternative A Drill Site Variation, and Alternative B.

CATEGORY	Alternative A				Alternative B	
	Proposed Drill Site		Variation Drill Site			
	(miles)	(acres)	(miles)	(acres)	(miles)	(acres)
ACTIVITY						
Access						
Existing Road Construction[1]	8.8	21.3	8.4	20.4	5.3	12.9
New Road Construction[2]	0.3	1.5	0.0	0.0	0.9	4.4
Subtotal	9.1	22.8	8.4	20.4	6.2	17.3
Drill Site						
Drill Pad	0.0	1.7	0.0	2.2	0.0	2.2
Cut/Fill Slopes, Topsoil	0.0	0.8	0.0	0.8	0.0	0.8
Subtotal	0.0	2.5	0.0	3.0	0.0	3.0
TOTAL	**9.1**	**25.3**	**8.1**	**23.4**	**6.2**	**20.3**
RESOURCE ELEMENT						
Air Quality	NSI[3]		NSI		NSI	
Transportation	NSI		NSI		NSI	
Geology	NSI		NSI		NSI	
Soils	SIM		NSI		SIM	
Road Construction on Side-slopes >40 percent	0.15	0.75	0.0	0.0	0.0	0.0
Special Handling Large Boulders						
Road	0.0	0.0	0.0	0.0	0.9	4.4
Drill Site	0.0	0.0	0.0	0.0	3.0	0.0
Poor to Fair Reclamation Potential						
Roads	9.1	22.8	8.4	20.4	6.2	17.3
Drill Site	0.0	2.5	0.0	3.0	0.0	3.0
Water Resources	NSI		NSI		SIM	
Stream Crossings (no.)	1				1	
Area of Road Construction w/i Stream Environment	0.0	0.02	0.0	0.02	0.0	0.03
Road Construction Paralleling but Out of Stream Environment	1.2	2.9	1.2	2.9	0.4	0.0
Vegetation	SIM		SIM		SIM	
Poor to Fair Reclamation Potential						
Roads	9.1	22.8	8.4	20.4	6.2	17.3
Drill Site	0.0	2.5	0.0	3.0	0.0	3.0
TOTAL	**9.1**	**25.3**	**8.4**	**23.4**	**6.2**	**20.3**
Riparian	0.0	0.02	0.0	0.02	0.0	0.03
Rare Plants	SIM		SIM		NSI	

Table 4.8 Continued

CATEGORY	Alternative A				Alternative B	
	Proposed Drill Site		Variation Drill Site			
	(miles)	(acres)	(miles)	(acres)	(miles)	(acres)
RESOURCE ELEMENT, CONT.						
Wildlife	SIM		SIM		SIM	
General Habitat Loss	9.1	25.3	8.4	23.4	6.2	20.3
Elk Winter and Transition Range	3.1	10.7	2.4	8.8	1.9	9.8
Sage Grouse Nesting Area	3.7	-	3.7	-	0.0	-
Visual Resources	SIU		SIU		SIU	
VQO Exceedance[4]						
Roads	1.1	3.5	0.4	1.0	0.5	2.4
Drill Site						
Physical Disturbance	0.0	2.5	0.0	3.0	0.0	3.0
Viewshed	0.0	970	0.0	710	0.0	600
Recreation	NSI		NSI		NSI	
Inconsistency w/ ROS Classification[4]	0.0	530	0.0	380	0.0	300
Hunter Disturbance/Displacement Area (acres)	970		710		600	
Socioeconomics	NSI		NSI		NSI	
Cultural Resources	SIM		SIM		SIM	
Health and Safety	NSI		NSI		NSI	

1 - Assumes a 20-foot-wide construction zone about the existing road.
2 - Assumes a 40-foot-wide construction zone.
3 - NSI = no significant impact; SIM = significant impact, mitigable; UNK = unknown, requires field survey during flowering season; SIU = significant impact, unmitigable.
4 - On Custer National Forest only.

avoid significantly impacting Gold Creek, the access route should be relocated 50 to 75 feet north. Assuming that relocation of this segment of road would be implemented, there is no major difference between the alternatives. The types and magnitude of impacts would be similar for each of the Alternative A route variations. *The Alternative A Drill Site Variation would be located closer to Ruby Creek where a higher risk of water pollution could occur compared to the proposed site.* Variation A3 could impact the Clarks Fork during bridge construction or reconstruction. The proposed project would not violate existing management direction in regard to water resources.

4.13.5 Vegetation, Timber, and Range Resources

Potential impacts to these resources directly relate to the clearing and disturbance of vegetation due to drill site and access road construction. Revegetation could be difficult due to low soil fertility and high coarse fragment contents. Wetlands are of particular importance as a sensitive and unique community type protected under the Clean Water Act. Range resources could be impacted through the reduction of forage, altered livestock movement and management, and increased potential for livestock/vehicle collision resulting in death. No significant impacts on these resources are expected, assuming recommended mitigation is implemented.

Important impact contrasts between Alternative A and Alternative B include the following: total disturbance to vegetation would involve 25.3 acres for Alternative A compared to 20.3 acres for Alternative B and 0.02 acres of riparian zone disturbance under Alternative A compared to 0.03 acres under Alternative B. *Implementation of Alternative A Drill Site Variation would involve 23.4 acres of total disturbance. The reduced disturbance would occur in the limber pine woodland and sagebrush scrub community types. This difference would not be considered significantly different from the proposed drill site.* Impacts to the riparian zone could require coordination with the Department of Army Corps of Engineers for a 404 permit pursuant to the Clean Water Act. As discussed under Soils, the probability for successful reclamation under Alternative A is higher than under Alternative B. *The probability of successfully reclaiming the Alternative A Drill Site Variation would be greater than for the proposed drill site.*

There would be no difference in impacts to plant species of concern between Alternative A and B drill sites as none of the species itemized in Table 3-4 were found to occur at these sites (Grah and Smith 1989). Only bird's foot sagebrush was identified along the access roads. Variation A4 would not impact this species as none were identified along this route. Of the other access route Variations, A1 would impact the species the least followed by A3, with A2 causing the greatest potential impact. Since these routes involve existing roads, the impact is not expected to be substantial.

The type and magnitude of impacts to vegetation would be similar for each of the Alternative A route variations. Variation A3 would disturb the least vegetation (15.5 acres), followed by A2 (18.0 acres), A1 (22.8 acres), and A4 (23.8 acres). Implementation of Variation A3 could impact the riparian zone along the Clarks Fork due to bridge construction or reconstruction. The proposed project would not violate existing management direction in regard to vegetation and associated resources.

4.13.6 Wildlife

Potential impacts to wildlife include reduction in habitat associated with soil disturbance and vegetation clearing, increased frequency of collision between wildlife and vehicles due to increased use of roads, and disturbance of wildlife activities in special habitats related to project activity. Significant impacts to wildlife, as defined in Section 4.6.2, include the following in order of their decreasing probability: 1) the displacement of elk from spring, winter, and fall ranges, 2) the displacement of black bears from spring and fall ranges, 3) an increase of more than 10 percent in the short-term direct mortality of wildlife species caused by collisions with motor vehicles, and 4) the death or injury of a federally-listed or candidate species of wildlife caused by a collision with a motor vehicle. No

significant impacts are expected to occur with the implementation of appropriate mitigation.

The potential for significant impacts to wildlife and the intensity of such impacts is generally greater under Alternative A than the *Alternative A Variation or* Alternative B. However, the implementation of: 1) timing constraints to protect elk calving activities and winter habitat, 2) timing constraints to protect restricted fall habitats of elk and black bear during years of extreme weather conditions, 3) rig removal to eliminate elk displacement potential during the winter months, and 4) the other mitigation measures prescribed in this document would reduce the impact potential of *any of the* alternatives to non-significant levels.

The Alternative B drill site is more peripheral to the main body of the elk winter range, is less used by elk during the winter, and is less of a travel corridor during seasonal elk movements than the Alternative A drill site. The visual impact of the drilling and construction activities, and its probable displacement effect on wintering elk would be lower on the Alternative B drill site than on Alternative A and *Alternative A Variation* drill sites because of differences between the drill sites in topography (i.e., the Alternative A drill site is on a prominent saddle while the *Alternative A Variation and* Alternative B drill sites *are* on hillslopes), seasonal elk distribution and movement patterns, and distances from the core of the elk winter range.

More winter and transition range forage of elk (10.7 vs 8.8 and 9.8 acres) and more total acres of wildlife habitats (25.3 vs 23.4 and 20.3) would be eliminated in Alternative A than in the Alternative A Drill Site Variation, and Alternative B, respectively.

The potential for road-killed wildlife would be somewhat higher under Alternative A because this alternative traverses more total miles (from 14.2 to 22.9 depending on access route variation) of wildlife habitats than the Alternative A Variation (13.5 to 22.2 depending on access route variation) or Alternative B (11.2). Alternative A and the A Variation traverse the same amount of sage grouse nesting habitat (3.7 miles), while Alternative B traverses none.

4.13.7 Visual Resources

The short-term impacts associated with construction of the drill pads and erection of the drill rig at the drill sites would be considered significant from most viewer positions due to contrasts in line, form, and possibly color that exceed levels prescribed by existing management direction for the area of interest contained in the Custer National Forest LRMP in the short term. Drill rig lights would be visible over a comparable area for both drill sites *but over a smaller area for the Alternative A Drill Site Variation.* Removal of the drill rig and application of recommended mitigation would bring the sites into compliance with the management direction. The construction of access roads would produce additional impacts to the visual resource. Widening of existing unimproved two-track roads and trails and construction of new road on Forest lands would increase the level of line contrast in the existing landscape. The level of contrast would be considered significant from viewer positions at or above the site of disturbance. Construction of access to the Alternative A drill site would cause more severe impacts than access to the Alternative B site*; however, the Alternative A Drill Site Variation would avoid the greater impacts.* Impacts associated with the Alternative B drill site would be more severe. Of the Alternative A route variations, Variation A1, Phillips' proposed access, would cause the least impact. The proposed project would violate existing management direction in the short term until reclamation is successfully achieved and the contrast in line, form, color, and texture meets visual quality objectives.

4.13.8 Recreation

Recreation impacts associated with the drill site locations would be relatively minor. Changes in the recreation opportunity characteristics of both sites would be small. Short-term displacement of limited numbers of recreationists would occur, as would a deterioration of the recreation experiences available to others who would continue to use

the surrounding areas. Although these impacts would involve relatively few people, the seasonal period designated for drilling activities would interfere with big game hunting, which is the primary recreation use occurring in both locations. However, such impacts would be insignificant if project activities overlap with only one fall hunting season. *Project activities that overlap more than one season could cause more severe impacts.* Beneficial consequences could result after project completion from improved public access to Forest lands providing opportunities for dispersed recreation.

Although the negative recreation impacts of *the three drill* sites would be minor except during the hunting season, the magnitude of negative effects would be smaller at the Alternative B site. This is due to the slightly lower hunting activity reported for that location and the smaller number of acres that would require a revised ROS classification. Also, drilling at the Alternative A site would involve road development and project traffic that could interfere with recreational use of the seasonal residence located near the Forest boundary, while no residences are located near to the Alternative B site. In addition, Alternative B may provide a slightly more favorable location for enhanced public access to the Forest if the FS were to secure the necessary rights-of-way following completion of project activities. Variation A1, Phillips' proposed access, would have the least impact on recreation. Variation A2 would have the greatest potential impact due to the greater length of public road used by recreationists. However, reconstruction and improvement of public roads along Variations A2 and A3 could improve recreationist travel on these roads. *Implementation of the Alternative A Drill Site Variation would reduce potential impacts from the proposed drill site.* Although there would be a reclassification of some areas from Semi-Primitive Motorized to Roaded Natural in the vicinity of the drill sites, this change would not be considered to be a violation of existing management direction.

4.13.9 Socioeconomics

Minimal negative socioeconomic impacts would result from project implementation. Some individuals, such as a few hunting outfitters or the owners of the seasonal residence adjacent to the Forest boundary, may be adversely affected. Additional people may feel that the economic future of the area lies not in extractive industries but in recreation/tourism. The negative economic impacts include a minimal loss of recreation benefits. These impacts are offset by property taxes and a substantial increase in community revenue flows. There would be no difference in the type and magnitude of impact between Alternative A *and Alternative A Drill Site,* and Alternative B. *Of the routing variations,* Variation A1, Phillips' proposed access, would have less impact on recreationists using the Meeteetse Trail or Robertson Draw road. The proposed project would not violate existing management direction in regard to socioeconomics.

4.13.10 Cultural Resources

All access route variations would affect cultural resources. Variation A1 would adversely impact the Meeteetse Trail and the Dilworth Post Office Complex and drive alignment which have been evaluated and are recommended for nomination to the National Register of Historic Places. The use of access route variation A1 would constitute an adverse effect to the complex because it would cause "isolation from or alteration of its surrounding environment and would introduce visual, audible, or atmospheric elements that are out of character with the property and alter its setting." None of the other access road alternatives would have any effect upon the property. The level of impact to cultural resources is much greater with the A1 routing variation than any of the other variations.

Variations A2, A3, and A4 would impact the Meeteetse Trail and stone circle site 24-CB-622. Impacts to both sites would be minor because in this area the Meeteetse Trail has been modified by modern vehicular travel and these variations avoid the main stone circle concentration at site 24-CB-622.

The access road to Alternative B (Gold Creek) would impact the Meeteetse Trail and stone circle site RC-3. Impacts to the Meeteetse Trail would be minor. Major impacts would occur through the center of RC-3.

4.13.11 Health and Safety

Overall, no significant impacts from hydrogen sulfide exposure or the increase in vehicular traffic *or decrease in hunter safety* are expected provided that best management practices and applicable mitigation measures are followed. There would be no difference in the type and magnitude of impact between Alternative A and Alternative B; however, the distance between a drill site and a residence is closer for Alternative A than for Alternative B. *The risk of exposure of the seasonal residents to H_2S would be greater for the Alternative A Drill Site Variation than for the proposed drill site. An increase in hunter safety could occur with the implementation of the Alternative A Drill Site Variation over Alternative A.* Alternative A access route Variation A1 would have the lowest potential of compromising public health and safety. The proposed project would not violate existing management direction in regard to health and safety.

4.13.12 Summary and Conclusion

As summarized in Table 4-9, there would be no difference in the type or magnitude of impacts that would occur between Alternative A and Alternative B for air quality, water resources, socioeconomics, cultural resources, and health and safety. The magnitude of impacts under Alternative A would be smaller than Alternative B for soils and vegetation since the probability of successfully reclaiming Alternative A is slightly higher. In contrast, the magnitude of impact under Alternative B would be smaller for wildlife and recreation. For wildlife, implementation of Alternative B would involve less disturbance to elk utilizing spring, winter, and fall ranges and migration and travel routes; less potential for increased road kill; a slightly smaller physical loss of winter and spring/fall transition range; and less overall disturbance of general wildlife habitat. From a wildlife viewpoint, either alternative is acceptable with the application of prescribed mitigation measures since potential impacts on both would be reduced to non-significant levels.

For recreation, implementation of Alternative B would involve less disturbance to hunters, less reclassification of ROS areas from Semi-Primitive Motorized to Roaded Natural, and no disturbance to residences near the Forest boundary. During project construction and drilling, adverse recreation impacts would be greatest under Variation A2; however, enhancement of public access would be best facilitated under Variation A2 where 10.8 miles of public roads would be improved and maintained. Neither Alternatives A or B provides direct public access to Forest lands as the access roads cross private lands adjacent to the Forest. Alternative B access would involve less impact to visual resources than access under Alternative A due to access road construction across the exposed steep sideslope; however, the Alternative A drill site would involve less impact due to its partially hidden location.

Since the magnitude and duration of visual impacts directly relates to the probability of successfully reclaiming disturbances, implementation of Alternative A would be slightly preferable to Alternative B.

Overall, implementation of Alternative A access route Variation A1, Phillips' proposed access, would cause the least impact to resources other than transportation *and cultural resources* in the project area as indicated in Table 4-9. Alternative A Access Route Variations A2, A3, and A4 would involve expenditures on existing public roads during minor reconstruction and provide additional maintenance to those roads during project operation. In contrast, implementation of Variation A1 or Alternative B would involve expenditures on unimproved private roads. Both the FS and BLM have indicated that improving the existing public roads in the project area would be preferable to improving private roads.

Further, construction of the permitted access route variation would determine the route of the public road system in the project area. If Alternative A Access Route Variation A1 or Alternative B were implemented, these routes could become major public roads by default, thereby producing additional improved two-lane roads in the project area. The FS, BLM, and Carbon County Commissioners prefer that no additional improved public roads be constructed in the project area. The visual resources conflict associated with the violation

Table 4-9. Comparison of Impacts Between Alternative A Access Route Variations.

ACTIVITY/RESOURCE	Access Route Variations			
	A1	A2	A3	A4
ACTIVITY				
Existing Roads (miles)				
No Reconstruction	5.0	5.0	1.5	7.6
Minor Reconstruction	0.0	10.8	5.6	0.9
Major Reconstruction	8.8	6.8	5.8	9.2
Subtotal	13.8	22.6	12.9	17.7
New Roads (miles)	0.3	0.3	0.3	0.3
Total Roads	14.1	22.9	13.2	18.0
RESOURCE				
Air Quality	same	same	same	same
Transportation				
Cost ($K)	30.9	46.5	166.0	39.0
Predominant Use	Private	Public	Public	Public/Private
Geology/Soils (acres)	22.8	18.0	15.5	23.8
Water Resources	same	same	same	same
Vegetation				
Disturbance (acres)	22.8	18.0	15.5	23.8
Rare Plants	same	same	same	same
Wildlife				
Elk				
Miles	3.1	3.1	3.1	3.1
Acres	10.7	10.7	10.7	10.7
Sage Grouse				
Miles	3.7	5.4	3.7	3.1
Visual Resources	low	high	moderate	low
Recreation	low	high	moderate	low
Socioeconomics	same	same	same	same
Cultural Resources	high	high	high	high
Health and Safety	same	same	same	same

of existing management direction contained in the Custer National Forest LRMP would need to be resolved in the decision-making process by the FS and BLM responsible officials.

Of the access route variations, implementation of A1 would pose the greatest potential of impacting cultural resources. These resources include the Dilworth Post Office Complex.

Implementation of the Alternative A Drill Site Variation would cause no substantial change in potential impacts from the proposed site for Air Quality; Vegetation; Timber, and Range Resources, Socioeconomics, and Cultural Resources. In contrast, the drill site variation would decrease potential impacts for Transportation; Geology/Soils (soils only); Wildlife; Visual Resources, and Recreation. Implementation of the drill site variation would cause increased potential impacts for Geology/Soils (Geology only); Water Resources; and Health and Safety. Overall, it appears that implementation of the Alternative A Drill Site Variation could result in reduced impacts; however, the potential increase in impact to water resources and Health and Safety should be considered in the decision-making process. Further, implementation of the drill site variation would reduce the potential of attaining the goals of the project which also should be seriously considered in the decision-making process.

4.14 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The term irreversible commitment of resources describes the loss of future options. This primarily applies to the effects of using non-renewable resources (e.g., minerals or cultural resources) or to processes or factors (e.g., soil productivity) that are renewable only over long periods of time. The term irretrievable commitment of resources refers to the loss of production, harvest, or use of natural resources. For example, some or all of the timber production from an area is irretrievably lost while an area serves as a winter sports site. The production lost is irretrievable, but the action is not irreversible; if use changes, timber production could resume.

The following discussion applies to the proposed action alternatives and not field development. Field development is discussed in Appendix B.

4.14.1 Air Quality

No irreversible or irretrievable commitment of resources would occur to air quality. Any short-term adverse impact to air quality due to implementation of the proposed project would be reversible. Similarly, these impacts would not be irretrievable since air quality is a transient characteristic subject to improvement through natural movements in the atmosphere.

4.14.2 Transportation

Except for the establishment of a permanent road system in the project area, no irreversible commitment of resources would occur to transportation due to the short-term nature of the project. Construction of the permitted access route variation would determine the route of the public road system in the project area. If Alternative A Access Route Variation A1 or Alternative B were implemented, these routes would become major public routes by default thereby producing additional improved two-lane roads in the project area. The FS, BLM, and Carbon County Commissioners prefer that no additional improved public roads in the project area be constructed. As such, implementation of Alternative A Access Route A1 or Alternative B could cause irreversible impacts. There is a minimal probability that irretrievable commitment of resources could occur, however, since the increase in traffic levels could affect existing road users. This impact could constitute an irretrievable commitment of resources, however, the impact would be short-term and would diminish upon project termination.

4.14.3 Geology/Soils

Any loss of topsoil during construction and reclamation activities or loss or reduction in soil productivity due to these activities would be an irreversible commitment of resources. This type of commitment is expected to be very small since best management practices as presented in Appendix D and FS Handbook

2509.22 would minimize loss of topsoil. Minimal irretrievable commitment of resources would occur during project implementation due to a small amount of productive soils being covered with new or reconstructed roads. This commitment of resources would last until project termination and reclamation of temporary roads and would last indefinitely for permanent roads.

4.14.4 Water Resources

No irreversible and minimal irretrievable commitment of resources would occur to water resources. Water used during project construction and drilling would be temporarily withheld from other uses. As indicated previously the quantity of water used would *be small* compared to the quantity of water available for other beneficial uses (i.e., human and other uses such as wildlife). Therefore, the irretrievable commitment of water resources would be short-term and *small.*

4.14.5 Vegetation, Timber, and Range Resources

The only potential irreversible commitment of resources that could occur to vegetation would be the direct mortality of individual plants due to project construction or during gas flaring. Plants as populations and communities, however, have the reproductive capacity to renew themselves. Consequently, no irreversible commitment of resources would occur to vegetation and associated resources as a whole. The interim loss of vegetation cover types during project implementation would be a minor irretrievable commitment of resources.

4.14.6 Wildlife

The only potential irreversible commitment of resources that could occur to wildlife would be the direct mortality of individuals. Wildlife species have the reproductive capacity to renew themselves and maintain their populations. Consequently, no irreversible commitment of resources would occur to wildlife populations. The loss of habitat use associated with vegetation clearing, or due to disruption of wildlife in terms of behavior, would be an irretrievable commitments of resources; however, with proper timing constraints the magnitude of such a commitment would be small, and the commitment would be reversible upon project termination and reclamation.

4.14.7 Visual Resources

No irreversible commitment of resources would occur to visual resources since project termination and reclamation would diminish visual impacts. Impacts to visual resources during project implementation would be irretrievable; however, the commitment would be minimal. Successful reclamation upon project termination would reverse the commitment.

4.14.8 Recreation

No irreversible commitment of resources would occur to recreation. The loss of or change in recreation opportunity during project implementation (i.e., displacement of hunters) would constitute an irretrievable commitment of this resource. Successful reclamation upon project termination would reverse this commitment.

4.14.9 Socioeconomics

No irreversible commitment of resources would occur to socioeconomics. Irretrievable commitments could include the loss or reduction of recreation benefits (i.e., revenues) due to displacement or alteration of the hunting experience. *This loss could be $2,284 for hunting and fishing, and $2,808 for other recreation as indicated in Table 4-7. This reduction would occur within the first three years of project implementation.* The total benefit of this project, however, would outweigh the magnitude of this loss. Upon project termination and reclamation this commitment would be reversed.

4.14.10 Cultural Resources

If cultural clearance surveys do not locate, identify, and inventory all sites and/or artifacts along or at a project facility, there is a chance that a site or artifact could be damaged or destroyed. Such an impact would be an irreversible commitment of resources. The loss of information that could be provided by such a damaged or destroyed site would

also be an irretrievable commitment of resources.

4.14.11 Health and Safety

No irreversible or irretrievable commitment of resources would occur in regard to health and safety.

4.15 LONG-TERM PRODUCTIVITY VERSUS SHORT-TERM USE OF RESOURCES

This discussion applies to the proposed action and alternatives and not to field development. Field development is discussed in Appendix B. As discussed under each resource element in this chapter, the impacts associated with implementing the proposed action, alternatives, or routing variations would be short-term impacts. No important irreversible commitment of resources would occur. Any irretrievable commitment would be short-term and reversible. Therefore, the short-term use of resources (i.e., impacts) would not compromise the long-term productivity of the project area. In contrast, short-term use of the existing county transportation system including road improvement could improve the long-term productivity of the project area through an improved public transportation system.

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MITIGATION AND MONITORING

Chapter 5

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5.0 MITIGATION AND MONITORING

The mitigation measures and monitoring requirements that follow will be included in the Conditions of Approval for the drilling proposal if project approval is granted. The measures and requirements were developed in response to impacts identified in the Environmental Consequences chapter (Chapter 4) and through issues identified during the *public* scoping process *and review of and comment on the DEIS*. The measures and requirements describe how drilling will be managed to assure compliance with the resource management goals and objectives of the Custer National Forest Land and Resources Management Plan (USDA-FS 1987*b*), applicable lease stipulations, and resource limitations identified during interdisciplinary analysis. The following measures and requirements apply to Alternatives A and B unless otherwise noted. If deemed necessary, in light of new facts or to minimize impacts, the following measures may be added to, modified, or selectively withheld. The Authorized Officer (AO) will determine final mitigation measures and monitoring requirements after consultation with the interdisciplinary team (IDT), who will have made recommendations based upon on-the-ground situation analysis.

5.1 ADMINISTRATIVE MEASURES AND REQUIREMENTS

- Conduct all operations in full compliance with applicable laws and regulations and the approved Application for Permit to Drill (APD, which includes the H_2S Contingency and Evacuation Plan).

- Phillips will adhere to applicable lease stipulations during all phases of the proposed drilling activity, or provide for written waiver of the stipulation(s) where adherence is not possible but acceptable with proper mitigation.

- Guide all phases of Phillips' exploratory drilling proposal, including road and drill site construction and maintenance and rehabilitation, by the dictates of the Clean Water Act. Control accidental discharge of all hazardous substances, including fuels, by methods described in a spill prevention and containment plan to be prepared by Phillips. Protect completely all single tanks of 660 gallons or larger and any aggregate of containers totalling 1,320 gallons or more.

- Utilize the Soil and Water Conservation Handbook (FS Handbook 2509.22, May 1988) and the Surface Operating Standards for Oil and Gas Exploration and Development (USDI-BLM and USDA-FS 1988) for reference to best management practices relating to road construction, drill pad construction, containment of drilling fluids and produced fluids and gases, and handling of all products and by-products of oil drilling.

- *Abide by requirements of On-shore Oil and Gas Order #2 (43CFR 3160).*

5.2 PRECONSTRUCTION PLANNING AND DESIGN MEASURES

- Phillips will submit for approval an access road design plan using roading guidelines approved for use by the Custer National Forest before starting construction.

- Phillips will submit for approval a road improvement plan for existing roads within the project area intended for use as part of exploratory drilling activities. The road improvement plan will specify road work needed to accommodate exploratory drilling activities. The plan will be agreed to in advance of any road improvement work by Phillips, the Bureau of Land Management (BLM) right-of-way requirements, and the Forest Service (FS). Phillips will schedule a review of this plan a minimum of 14 days in advance of anticipated start work date. Construction, reconstruction, and maintenance activities on county roads in the project area will be in accordance with a Memorandum of Understanding between Carbon County and Phillips.

- Phillips will prepare and submit a comprehensive drill site design plan to the BLM and FS for approval prior to initiation of construction. This plan will show the layout of the drill pad over the

existing topography, dimensions of the pad, volumes and cross sections of cut and fill, location and dimensions of the cuttings trench, and access road egress and ingress.

- Phillips will slope-stake all construction activities and receive approval by the FS prior to start of construction.

- Require a qualified inspector to be on-site during all construction and reconstruction activities to assure contractor compliance with approved road and drill site design plans. Phillips will provide the qualified inspector.

5.3 RESOURCE SPECIFIC REQUIREMENTS

- For all resources, initiate immediate abatement procedures once a problem is identified.

5.3.1 Air Quality

- Optimize the total construction or the amount of construction at any one time to reduce generation of fugitive dust. Further reduce impacts of air pollutant emissions from well drilling by maintaining a reduced vehicle speed limit to minimize dust suspension.

- Do not allow open burning of garbage or refuse at the drill site.

- The FS, in coordination with the BLM, will specify the procedure, such as application of water (or other approved dust suppressants) for dust abatement at the drill site and along the access routes as well as locations for use and application rates. Water, if approved for this purpose, must be obtained by Phillips from state-approved source(s).

5.3.2 Transportation

- Place warning signs at strategic locations along the access route to alert road users of the heavy truck traffic hazard.

- Use escort vehicles on all public roads to alert road users of the heavy truck traffic hazard.

- Use radio control to manage both project-related traffic and public traffic.

- Construct intervisible turnouts along public roads to assist in safe passing along the access route.

- To restrict public access to the project area, use gate guards at several potential locations, including the Forest boundary, where the access road enters private land, or where the road enters the narrow portion of the Ruby Creek or Gold Creek canyons.

- Coordinate with the Montana Highway Department in regard to planned reconstruction of Highway 72 and intended truck use of this highway.

5.3.3 Geology/Soils

5.3.3.1 Access Roads

Construction:

- Minimize the width of the construction zone to that absolutely necessary to perform the road construction.

- Selectively salvage between 6 and 12 inches of topsoil (i.e., suitable plant growth material) from the construction right-of-way (ROW) prior to construction. Store topsoil away from construction area and other subsoil materials to minimize loss of the topsoil resource.

- Selectively remove large boulders from topsoil prior to topsoil salvage and/or transport to facilitate minimization of the loss of topsoil.

- Locate areas of topsoil excess that could be used to meet topsoil deficits. Transport topsoil from surplus areas to deficit areas so that at least 6 inches of topsoil is spread over disturbed areas to be revegetated.

- Design and construct optimum erosion and runoff control structures to reduce accelerated erosion and increased off-site sedimentation.

- Bench cut and end haul construction across the 800-foot-long, 50 to 60 percent slope near the Alternative A drill site is recommended over conventional cut and fill construction to facilitate road maintenance as well as final reclamation.

Reclamation:

- Respread an average of 6 inches of topsoil on all cut and fill surfaces of reconstructed existing roads, seed, fertilize, and mulch all disturbed areas according to the site-specific erosion control, revegetation and rehabilitation plan (ERRP) provided in Appendix D.

- Recontour all new road on Forest and BLM lands (if required) to approximate original contour and respread an average of 6 inches of topsoil across the recontoured ROW surfaces. Seed, fertilize, and mulch all disturbed areas per Appendix D.

- Protect all topsoil stockpiles from erosion by mulching, netting, matting, and/or revegetation.

- In areas with high boulder content, selectively handle boulders to facilitate topsoil respreading. Boulders should be randomly replaced and/or buried over the area to reduce visual impacts.

- Design and construct optimum erosion and runoff control structures such as waterbars and turnouts to reduce accelerated erosion and off-site sedimentation per Appendix D.

- Monitor all reclaimed areas for successful reclamation in terms of reduced erosion and revegetation success per Appendix D.

5.3.3.2 Drill Sites

Construction:

- Minimize the area of disturbance to that absolutely necessary to construct the drill pad and ancillary facilities.

- Selectively salvage a minimum of 12 inches of topsoil from the drill pad area prior to construction. Store topsoil away from construction area and other subsoil materials to minimize loss of the topsoil resource.

- Selectively remove large boulders from topsoil prior to topsoil salvage and/or transport to facilitate minimization of the loss of topsoil.

- Design and construct optimum erosion and runoff control structures such as cutoff trenches, interception ditches, waterbars, etc., to reduce accelerated erosion and increased off-site sedimentation per Appendix D.

Reclamation:

- A site-specific ERRP for both Alternative A and Alternative B is presented in Appendix D. This plan includes a document summary, project administration, site specific ERRP measures, and monitoring and maintenance. All reclamation practices associated with the drilling proposal will conform with the approved standards and methods provided in this plan.

5.3.4 Water Resources

- To reduce impacts to water resources, minimize the area of disturbance to that absolutely necessary for construction, operation, and reclamation of the drill site and access road. This is particularly important in close proximity to stream environments.

- Implementation of the site-specific ERRP presented in Appendix D would effectively reduce surface runoff, erosion, and off-site sedimentation.

- State-of-the-art well casing and cementing technology would minimize contamination of groundwater during well drilling and well operation. This technology includes casing the well during drilling and well

cementing the annulus between the casing and wellbore.

- The cuttings trench should be designed such that only 75 percent of total capacity is utilized, leaving the balance as a buffer to hold direct precipitation and runoff.

- A synthetic membrane liner of sufficient thickness *(> 12 mil)* to minimize puncture or fatigue should be placed within the trench to minimize the potential of leakage.

- The design and timely implementation of a spill prevention and control plan would greatly reduce impacts that could occur in the unlikely event of a spill at the drill site or along the access road.

- All stream or channel crossings should be designed for the 50- to 100-year storm event. FS Handbook 2509.22 should be used as a guide in designing all runoff and erosion control structures.

- If Alternative B is implemented, the access route in close proximity to Gold Creek should be relocated approximately 50 to 75 feet north of the existing trail to avoid the potential of increasing creek sedimentation.

- All water withdrawal (i.e., surface water and groundwater) and use will comply with state law. This includes obtaining instream diversion rights and groundwater allocation permits.

- *The FS shall not allow Phillips to construct instream diversions from Gold or Ruby Creeks for project-related water requirements.*

- *Phillips will be required to design and implement a surface water quality monitoring program for the project. This plan will be submitted to the FS and BLM for review and approval prior to initiation of project construction. This plan should include establishing baseline surface water quantity and quality, as well as aquatic condition prior to project implementation. The following guidelines should be followed in designing the monitoring plan.*

A. Objectives of Monitoring Plan

1) Establish baseline conditions for surface water quantity and water quality prior to project implementation.

2) Detect changes in surface water quantity and quality that may occur during project implementation and following until terminated by the authorized FS official.

3) Provide a measure of the success of remedial measures implemented (ie. whether baseline conditions were achieved and maintained) in the event that significant reduction or alteration of surface water quantity or quality resulted from project implementation.

B. Location of Sampling Stations

At a minimum, two sampling stations should be established for either alternative selected. Depending on which alternative is selected, one station should be located at a position above the drill site along Ruby Creek for Alternative A and along Gold Creek for Alternative B. A second station should be located below each drill site along the respective stream. The upper station would serve to measure baseline conditions during project implementation, while the lower station would be used to detect changes and/or impairments in water quality and/or quantity. Location monuments consisting of a steel post should be installed at each station to permanently mark and identify the station. The stations should be located on a relatively uniform and straight reach of the stream with a smooth rock bottom which will provide adequate hydraulic control.

C. Recommended Methods

All measurements taken during the

implementation of the monitoring program should be accomplished according to the National Handbook of Recommended Methods for Water-Data Acquisition (USGS 1977). The following recommended methods should be implemented prior to project implementation to establish baseline conditions, during project construction and operation, and after final reclamation and abandonment until the reclamation success has been reached. If significant alteration in surface water flow or reduction in the quality of the measured parameters are detected during project monitoring, immediate steps should be taken to identify the cause/source and remedial measures applied.

1. Surface Water Quantity

a) Stage-discharge relationship should be established by placing a staff gage, measuring the cross sectional topography of the stream reach, and measuring the depth of the water level and velocity of water in incremental cells at several different discharge events (high, medium, and low).

b) Discharge measurements should be taken each month and records compiled. The discharge measurements should be coupled with the monthly water quality measurements to provide an integrated indication of the distribution of water quality in time and with discharge stage.

2. Surface Water Quality

a) Water quality parameters should be measured at each station on a monthly basis. Parameters that should be measured following USGS (1977) include: temperature, specific conductance, dissolved oxygen, alkalinity, and pH.

b) Grab samples of water from each station should be obtained on a seasonal basis (May for pre-runoff, July for post-runoff, November for late-fall, and February for mid-winter) and submitted to an EPA certified water quality analysis laboratory and analyzed according to EPA (1979). The following parameters should be analyzed for: total suspended solids (TSS), total dissolved solids (TDS), carbonates (HCO_3, CO_3), sulfate, sulfide, phosphate, nitrate, chromium, cadmium, aluminum, copper, lead, mercury, nickel, zinc, and oil and grease.

c) Should a change in water quality be detected, the source of the change should be identified and appropriate remedial measures applied. In addition, FS employees and Phillips or contractor employees should be trained to observe and measure the turbidity of surface water on a daily basis and note any substantial changes in turbidity. Should such changes be identified, the source of increased turbidity should be identified and appropriate remedial measures applied.

D. Reporting and Data Presentation

All data should be analyzed and compiled into annual reports which describe the characteristics of the surface water both in text and graphically. Problems or impacts identified during the monitoring process, remedial measures applied,

and success of the remedial measures should be included in the annual report. The annual reports should be submitted to the FS for review.

5.3.5 Vegetation, Timber, and Range

- Adverse impacts to vegetation and associated resources could be greatly reduced or avoided by revegetating all disturbed areas as soon as possible after construction through implementation of a site-specific ERRP as itemized in Appendix D.

- Road construction and reconstruction should avoid wetland areas. If avoidance is not possible, the area of disturbance should be minimized.

- Only certified weed-free mulch and seed should be used for erosion control and revegetation purposes.

- A monitoring program should be designed and implemented to detect noxious weed invasion. If an invasion is detected, eradication measures should be implemented immediately.

- All range improvement structures such as fences, cattleguards, and water developments should be left in functional condition to ensure current allotment management operations could continue.

5.3.6 Wildlife

- In order to minimize the probability of displacing elk from their seasonal transition, fall/rutting, winter, and calving habitats, project operations within designated elk habitats should be limited to the period extending between June 15 and November 15 during years of normal climatological events. During years of abnormal climatological events (drought, unseasonably early and heavy snow, extensive fire, etc.) drilling operations should be terminated on a designated date between September 15 and November 15, when or if FS officials, in consultation with MDFWP biologists, determine that the continuation of operations beyond such date would have a significant negative impact on elk according to the impact significance criteria defined in Section 4.6.2. In the event that drilling cannot be completed in a single operational period (June 15 - November 15), the rig should be dismantled, removed from the elk range, and stored until June 15 the following spring. To avoid the possibility of elk developing a permanent or long-term avoidance behavior towards the drill site, drilling activities should not continue through November 15 for more than 2 consecutive years. *Noise levels at the drill site shall be maintained within the limits which elk will adapt to and which will not increase their displacement distance beyond that already created by visual impacts (i.e., the viewshed). In order to contain the displacement of elk within these limits, noise levels within 300 feet of the drill site should not exceed 65 decibels (dB).*

- Road maintenance and construction work outside of designated elk habitats can be performed at any time without impacting elk. In order to facilitate big game movements and minimize the potential for injuries, road access ROWs should not be fenced.

- The potential for vehicle/wildlife collisions could be reduced substantially by requiring all drivers to undergo a training session describing the species of wildlife in the area that are susceptible to vehicular collisions, the circumstances under which such collisions are likely to occur, and the measures that could be employed to minimize them. The probability of animal/vehicle collisions could be further reduced by imposing speed limits on access roads and prohibiting night travel. If night travel cannot be eliminated, speed limits should be further reduced during the hours of darkness.

- Because black bears are common in the area, steps should be taken to minimize the possibility of attracting them and to avoid possible human/bear encounters. All personnel should be informed and educated regarding actions and circumstances that are likely to result in human/bear encounters and the measures that could be

taken to minimize the potential for such encounters. The prescribed Interagency Grizzly Bear Guidelines for food handling and storage and the disposal of garbage should be followed to minimize the possibility of attracting bears. No dogs or firearms will be allowed on the drill site or the project-related area. Any bear problems should be reported promptly to biologists of the MDFWP. The same climatological and time constraints described previously in this section for elk are equally applicable to black bears and should be exercised in order to avoid impacts to this species (Stewart 1989).

- In order to reduce *potential* incidents of game law violation all project workers should be instructed on local wildlife regulations and state wildlife laws and regulations posted in conspicuous places at the job sites. Personnel should also be instructed about the nature of the wildlife species which occur on the work site, potential impacts to these species and measures that could be taken to avoid or minimize impacts. Project workers should report bear sightings, raptor nests, and other noteworthy wildlife occurrences to MDFWP.

- The drill site and adjacent disturbed habitat should be reclaimed to approximate pre-project levels for vegetative cover and physical condition in the event of a dry hole. During reclamation a variety of forage species that are useful to resident herbivores should be established (See Appendix D).

- If Alternative B is selected, a survey should be conducted to determine whether or not an active prairie falcon nest is present in the limestone cliffs adjacent to Access Segment 2. If an active nest is found within the zone of influence of the access road, it may be necessary to delay road construction activities until late into the young-rearing period (early June).

- A helicopter survey of cliff habitats in the vicinity of the proposed well sites should be performed prior to commencement of drilling activities *or other project-related construction activities on the Forest* to determine whether or not peregrine falcons are nesting there. Survey procedures will be conducted under the direction of the FWS and MDFWP in strict compliance with their specifications. In the event nesting activities are found, the FWS and MDFWP must be consulted immediately and appropriate mitigative actions developed and implemented.

- In order to: 1) maintain an on-going assessment of the effectiveness of prescribed mitigation measures, 2) obtain a specific measure of elk response to the proposed actions, and 3) develop a solid database for use in possible future environmental assessments of field development, it is recommended that the elk study currently being conducted by Dr. Fred Van Dyke be continued at least throughout the exploratory drilling phase of the project. When or if field development is undertaken, the study should be continued to monitor effects on elk.

5.3.7 Visual Resources

5.3.7.1 General

- Implementation of the site-specific ERRP, as presented in Appendix D, would greatly reduce impacts to visual resources.

5.3.7.2 Access Roads

- During construction, protect existing vegetative cover (trees and shrubs in particular) at the edge of the ROW. Regrade, revegetate, and replace windrowed boulders as described in the Soils Mitigation Section and in Appendix D.

- To reduce the short-term adverse impacts associated with road construction, take steps to minimize fugitive dust.

5.3.7.3 Drill Sites

- All permanent structures should be painted a flat, non-contrasting color that is harmonious with the adjacent landscape, except for structures which require safety coloration in accordance with Occupational

Safety and Health Administration requirements.

- Maintain existing screening vegetation by minimizing the removal of trees and shrubs.

- After completion of well construction and drilling, recontour the pad to approximate original contours. Revegetate with indigenous or adapted species that match native plant community character and phenology. Planting should occur at the earliest suitable planting date.

- Replace boulders on the pad area in a pattern that reflects boulder arrangement in adjacent undisturbed areas per Appendix D (Alternative B). Remove all post-construction debris immediately after construction.

5.3.8 Recreation

Mitigation measures specified for wildlife and visual resources would also help to reduce the magnitude of recreation impacts.

- Maintain existing regulations that prevent public motorized travel on Forest lands in the analysis area, thereby minimizing the adverse effects of vehicle-related noise and dust on recreation.

- *Should* construction, drilling, *and reclamation* activities *last into a second year, terminate these activities prior to the start of the rifle hunting season of the second year.*

5.3.9 Socioeconomics

No specific operation and maintenance mitigation has been identified for Socioeconomics.

5.3.10 Cultural Resources

- *If Alternative A Access Variation A1 is selected, complete a detailed datum-based mapping and excavation at the Dilworth Post Office and drive alignment site 24-CB-38. Also, require survey mapping and photographic documentation of the Meeteetse Trail.*

- *If Alternative B is selected, require datum-based mapping of stone circle site RC-3. Stone circle features and intervening ring exterior areas would require excavation through the site keyed to the surveyed road route. Also, require survey mapping and photographic documentation of the Meeteetse Trail.*

- *Under Alternative A Access Variations A2, A3, and A4, require detailed datum-based mapping and excavation of stone circle site 24-CB-622. Selection of Variation A3 requires the analysis of the potential National Register significance of the truss bridge crossing the Clarks Fork River.*

- *If any cultural values are observed during construction operations, they should be left intact and the District Ranger, Beartooth Ranger District, or the District Manager of the BLM, Miles City District, should be notified. The ranger/manager would conduct an evaluation of the cultural values to establish suitable mitigation measures.*

5.3.11 Health and Safety

- To minimize undue exposure to hazardous situations, require measures that would preclude the public from entering hazardous areas and warning signs alerting the public of truck traffic.

- Implement the H_2S contingency and evacuation plan (Appendix E) to reduce harm and injury to workers.

- To alert the public of the H_2S hazards, erect warning signs at strategic locations around the drill site, along access roads, and at access points along the Face-of-the-Mountain Trail.

- Publish a public notice in local newspapers informing the public of any H_2S status changes during the drilling operation.

- Implement the mitigation measures presented in the Transportation Section in regard to driver safety.

- If drilling is allowed during the rifle hunting season, restrict carrying of loaded

rifles in the Ruby or Gold Creek drainage depending on the alternative selected.

- Phillips will be responsible for assuring that the public is fully informed of the potential danger resulting from drilling in known H_2S zones. Informing the public will consist of posting a gate guard at the mouth of Ruby Creek or Gold Creek drainage (depending on alternative selected) and by posting appropriate H_2S warning signs at both entrances to Ruby Creek or Gold Creek Drainage (depending on alternative selected) on the Face-of-the-Mountain Trail. These measures would be implemented during Condition-Yellow and Condition-Red warnings (See the Contingency and Evacuation Plan presented in Appendix E for definition of these condition classes).

- *If deemed necessary by the Forest Service to assure public safety, Phillips shall patrol the Face-of-the-Mountain Trail during the big game hunting season to preclude hunters from entering the drill site area.*

- *Phillips shall abide by all state and federal fire regulations.*

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CONSULTATION AND COORDINATION

Chapter 6

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6.0 CONSULTATION AND COORDINATION

An Environmental Impact Statement (EIS) must be prepared when a federal government agency considers approving an action within its jurisdiction that may significantly impact the human environment. An EIS aids federal officials in making decisions by presenting the environmental facts on a proposed project and its alternatives. As previously mentioned in Chapter 2, the first step in preparing an EIS is to determine the scope of the project, the range of action alternatives, and the impacts to be included in the document.

The Council on Environmental Quality (CEQ) regulations (40 CFR, Parts 1500-1508) require an early scoping process to determine the significant issues related to the proposed action and alternatives that the EIS should address. The principal purpose of the scoping process is to identify important issues, concerns, and potential impacts that require detailed analysis in the EIS and to eliminate insignificant issues and alternatives from detailed analysis.

The Phillips Ruby A Federal EIS was prepared by a third party contractor, with the Forest Service (FS), Custer National Forest, Billings, Montana, the lead agency and the Bureau of Land Management (BLM) Miles City District Office, Miles City, Montana, the joint lead agency.

6.1 PUBLIC PARTICIPATION

Phillips originally filed an Application for Permit To Drill (APD) with the BLM on January 21, 1988, for an exploratory drilling proposal on the north end of the Line Creek Plateau in the northeast quarter of the northwest quarter of Section 9, Township 9 South, Range 20 East of the Montana Principal Meridian (NE1/4 NE1/4 Sec 9 T9S R20E, MPM) (Chapter 2, Alternatives Considered But Not Analyzed in Detail). Prior to the filing of the APD, an interdisciplinary team (IDT) field review of the proposed drill site and alternatives was conducted with representatives of the FS, the BLM, Phillips, and the consultant interdisciplinary team on November 10 through November 12, 1987. After receipt of the Phillips' APD, the FS and BLM conducted public scoping of the proposal. Public issues and comments regarding the Phillips proposal were solicited for incorporation into this EIS through the scoping process. Scoping for the Ruby A Federal Prospect proposal consisted of preparation and submittal of a scoping letter to interested individuals, organizations, and companies. The scoping letter contained the location and submittal date of the APD, described the action to be analyzed; identified preliminary land and resource management issues, concerns and opportunities; and outlined timing needs for public involvement. In addition, the letter provided information on how groups/individuals/agencies could become involved in the analysis process. The letters were mailed to people and organizations who had shown an interest in this specific proposal and to those people and organizations who have shown an interest in similar projects in the past. Scoping meetings and open houses were conducted to solicit public input regarding the proposed action. A scoping meeting was held in Red Lodge, Montana, by the FS and BLM on Tuesday, March 22, followed by an open house on Wednesday, March 23. In addition, the FS and BLM conducted a public meeting in Billings on April 11, followed by an open house in Billings on April 12. Oral and written comments were taken at the public meeting sessions as well as at the open house sessions. As previously mentioned in Chapter 2, considerable adverse public reaction was received during scoping by the FS and BLM regarding the Line Creek Plateau drill site proposal.

As discussed in Chapter 2, Phillips informed the FS on July 5, 1988, that they were withdrawing their Ruby A Federal drilling proposal located in the NE1/4 NW1/4 of Sec 9 T9S R20, and that they would submit a new APD for a surface location in the NW1/4 NW1/4 of Sec 15 T9S R20E on the east face of the Line Creek Plateau. The revised proposal was submitted to the FS and BLM on August 3, 1988. The FS and BLM determined at this time that a public meeting presented by Phillips, combined with news releases to the local news media would be adequate to inform the public on changes in the drilling proposal. Phillips conducted a

public meeting in Red Lodge on August 18, 1988. News releases on the revised drilling proposal were submitted to the local news media in Red Lodge, Billings, and Columbus, Montana; and Cody, Wyoming.

There were 39 written responses received during the scoping period in response to the revised drilling proposal. These written responses consisted of 15 postcards and 11 letters against the drilling proposal, and 2 letters and a petition letter with 80 signatures in favor of the revised drilling proposal. The scoping responses are summarized as 82 for the drilling proposal and 26 in opposition. The issues and concerns identified by the public during the scoping period are summarized in Chapter 1.

Based upon sensitive environmental issues associated with the revised drilling proposal identified during additional public involvement, the Responsible Officials for the project (FS, Custer National Forest Supervisor, Montana, and BLM, Miles City District Manager, Montana) concluded that the Phillips proposal may significantly affect the human environment and that an EIS was required. Following this decision, the EIS analysis process for the revised drilling proposal commenced in September 1988.

6.2 PUBLIC AND AGENCY INVOLVEMENT

During preparation of the EIS, the joint lead agencies have communicated with, and received input from the various federal, state, county, and local agencies, elected representatives, environmental and citizens groups, industries, and individuals potentially having issues with the proposed drilling action. The following agencies, groups, and individuals have provided input and/or will receive copies of the EIS.

6.2.1 Federal Government Agencies

Advisory Council on Historic Preservation
Department of Agriculture:
- Forest Service
- Office of Equal Opportunity
- Soil Conservation Service
- Rural Electri*fication* Administration

Department of the Army:
- Corps of Engineers

Department of Commerce:
- National Oceanic and Atmospheric Administration

Department of Defense:
- Department of the Air Force
- Department of the Navy

Department of Energy
Department of Housing and Urban Development
Department of Health and Human Services
Department of the Interior:
- Bureau of Indian Affairs
- Bureau of Land Management
- Bureau of Mines
- Bureau of Reclamation
- Fish and Wildlife Service
- National Park Service
- Geological Survey

Department of Labor
Department of Transportation
Environmental Protection Agency
Federal Aviation Administration
Federal Energy Regulatory Commission
Federal Highway Administration
Federal Railroad Administration
General Services Administration
Interstate Commerce Commission
U.S. Nuclear Regulatory Commission

6.2.2 State Government Agencies

State of Montana, Department of Fish, Wildlife, & Parks
State of Montana, Department of Natural Resources
State of Montana, House of Representatives
State of Montana, Intergovernmental Clearinghouse
State of Wyoming, Interstate Streams Engineer
State of Wyoming, State Engineers Office
State of Wyoming, State Planning Coordinators Office
State of Wyoming, Wyoming Game & Fish Department

6.2.3 Local Governments

Carbon County Clerk/Recorder's Office

Carbon County Commissioner
Red Lodge Chamber of Commerce

6.2.4 Environmental Groups and Others

Billings Gazette
Billings Rod and Gun Club
Bridger Public Library
Carbon County News
Casper Star-Tribune
Drillsite Security Systems
Eastern Montana College Outdoor Program
Exxon Company, U.S.A.
Greater Yellowstone Coalition
Headwaters Journal
Hotline Energy Reports
Marathon Oil Company
Medicine Lake National Wildlife Refuge
Mobile Oil Corporation
Montana Oil Journal
Montana Petroleum Association
Montana Wilderness Association
Montana Wildlife Federation
Nance Petroleum Corporation
National Wildlife Federation
Northern Plains Resource Council
Park County Commissioners
Petroleum Association of Wyoming
Phillips Petroleum Company
Red Lodge Chamber of Commerce
Red Lodge Rod and Gun
Red River Oil & Gas, Inc.
Rimrock 4 X 4 Club
Sierra Club
Stillwater Protective Association
Texaco Inc.
Voyageur Outward Bound School
Western Oil World
Wilderness Society
Yellowstone Chapter of the Audubon Society

6.2.5 Task Force Members

Greater Yellowstone Coalition, Louisa Wilcox
Line Creek Protective Association, Montana Wildlife Association, Lee Fears
Montana Petroleum Association, Janelle Fallan
Phillips Petroleum Company, *Ed Hasely*
Red Lodge Chamber of Commerce, Art Maxwell
State of Montana, Department of Fish, Wildlife and Parks, Shawn Stewart
State of Wyoming, Wyoming Game & Fish Department, Larry Roop
Stillwater Protective Association, Rae and Trudy Shunk
U.S. Department of Agriculture, FS, G. Weldon
U.S. Department of the Interior, BLM, Ed Giebel

6.2.6 Others

David Alderswerth
W.W. Allen
Vince Ames
Cathy Anderson
Gene Anderson
Waynard Anderson
Nancy Asbury
Kendall M. Awes
LeRoy Axtell
Curtis Ballew
John Battagalia
Max Baucus, Senator
Pat Bellinghausen
Peter Bennett
Roy Bennett
Paul Berg
Bill & Jan Bevins
Loren Bice
John Billings
Mac Black
Roy Boles
John D. Bonner
Dr. Dwayne S. Borgstrand
Warren & Vicki Bowman
Patricia Bradley
Sherry Branger
Bruce W. Brannick
Dave Brink
Pattie Brennan
Roy Brothwell
Donald K. Budde
Sandra Burrows
Thomas & Jean Busch
Debbie Campbell
Julia Carlson
Krisi Carlson
Steve Carrington
Bob Carroll
Rita Cetrone
Jamie Chadwick

6.2.6 Others, Continued

Dennis Chatlain
Barbara H. Christensen
Mildred Christian
Howard Christiansen
Brad Cicci
Albert & Ruth Clark
Douglas M. Clark
Jake Coates
Nancy Coates
Stuart E. Coleman
G.M. Connelley
Harry Conners
Frank Cooney
Jerry Cooney
Jackie Crandall
Karla Millette Crees
Gary Crick
Tom Croft
John Daggett
Rich Day
Bev Delladio
Joe Dobry
Kathleen Dodson
Tony Duke
Sue & Bill Dutcher
Kathleen Dykstra
Dr. Charlotta Eaton
Larry D. Eaton
William H. Eaton
Lila Espeseth
Bill Evans
E.F. Evert
Bill Fake
Janelle K. Fallan
Bruce Farling
Jay Faulk
Bruce Fauskee
Joe Favero
Lee Fears
R.E. Fears, Jr.
Carol L. Ferguson
Gary & Jane Ferguson
Jeanne T. Fish
Mary E. Fitzpatrick
Wes Fleming
Roger Fliger
Dan Frank
Tom France
Scott Fraser
Ken Frazier
Norman H. Frisbie
D. Scott Frizzell
Wendy Frueauf
Jim Fodor
Barbara L. Gallup
Ron Gammil
Jim Garner
Paul B. Garrison
Donald Geiger
Lary Geisler
Richard & Joyce George
Ronald & Carolyn Gerondale
Lyle D. Gillison
Larry Glenn
Mike Grayson
Gary W. Grocholski
Mary E. Gunn
Cynthia Z. Gustafson
Everett Hagen
Elizabeth A. Hall
Dorcas Halverson
Ed Hamilton
Kristie Hamrick
Lee J. Hanchett
Kenneth Hanify
Jonathan Hanna
Dorothy Hardy
George S. Harger
Bob Harrington
Doug Hart
Trent Hauge
Manya Haugen
Mick Hawman
Angie Hazelswart
Heath C. Heigis
Dave Henigman
Mathew Henke
Peter A. Herzog
Roger Hoffman
Jack Horan
Robert A. Howard
Robert & Juanita Houghton
Betty Huffard
L.D. Hunter
Zona & Tom Huss
Doyce Hutson
Dr. Brian L. Horejsi
Dorothy Houser
James Howell
Keith Iverson
Robert D. Jacobsen
Charles Janning
Norma M. Jarvi
Dr. Michael D. Johnson
Suzanne Johnson
Lawrence B. Jones
Ray Judd
Alan Kampmeyer

6.2.6 Others, Continued

Elizabeth Kearney
Connie Keller
Roger Kembel
Rocky & Mary Kerr
Christopher Kersten
Robert S. Kirk
George Klepich
Philip R. Knight
Heather Knox
Karen Knox
Wava L. Knudson
Lana Kober
Ruth Koch
Ed Kommers
Roger Koontz
Jeff Kostelecky
Bob Krall
Nancy Krekeler
Paul Kruger
Arline Lambert
Larry & Darlene Larson
Hjalmer F. Lee
Randy Lewis
Laura Lindley
Thomas Lose
Bruce Lough
D.P. Loughry
Sue Lowry
L. Gary Lundvall
Betty Rae Luskinkill
Eric Lybecker
Dean A. Lydig
Don Lyle
Sidne Lynde
Scott Mann
J.E. Manning
Mary Ann Marble
Lynda Martinsen
Michael Matovich
Art Maxwell
Tom P. May
John McCullough
Fred & Betsy McGee
Bob McKinney
Victor E. McKinney
Ron McKnight
R.P. Meabon
Larry Mehlaff
John C. Miller
John W. Miller
Rod S. Miller
Richard & Carolyn Morse
Tim Mort
John L. Muhelui
John Mundinger
Dan Neal
Brent Nearpass
Donna & Scott Nelson
L.B. Newell
Roger Newman
Jack Nichol
James E. Nielson
Andrea Norwood
Mona Nutting
Dennis Olson
Brian Oltragge
Isabelle Orthman
Jill I. Ost
Harry J. Owens
J.Y. Parker
Tanya Parks
Ron Pattishall
Wendell Peterson
James Phelps
Mr. & Mrs. Henry Philhower
Jim Pierce
Julius Pilati
Paul Pilati
Mark E. Polakoff
Joe Porcarelli
Noah H. Poritz
John E. Prinkki
John C. Purcell
Richard A. Purcell
Katherine M. Quillan
Carmen D. Redmond
Mary Reece
Steve Reitz
Charlotte M. Rice
Barbara E. Rideout
Marian Rix
Richard Ridgway
Patrick Roddy
Elma Romersa
Larry Roop
George & Margery Rossetter
Cindy Rupe
Glenn Saunders
Ralph Saunders
Randy Schalla
Ron Schalla
Roy Schalla
Lynn Scheely
William C. Schilling
Fred Schmidt
Kip Schnackenberg
Dorothea Schultz
Alan Schuyler

6.2.6 Others, Continued

Gerry Sekorski, Congressman
Margi Sheehy
Peter Shelly
Ken Shense
R.W. Sigley
John Simic
Robert A Sloate
Jim Smedsrud
Don & Judy Smishek
Tony Smith
Trevor Smith
Larry & Wendy Sonnenberg
Sam Spaulding
Mary Spelman
D. Curtis Starr Jr.
Jack Steinmasel
Jan Stewart
Shawn Stewart
Dennis Stingley
Richard A. Strait
Janell Streck
Doug Stringary
Ernnest Strum
Robert D. Stuart
Geri Sullivan
Vernon P. Sundberg
Dave Swanz
Deborah F. Tangen
Don Taylor
Renee Taylor
Howard L. Thom
Dain Thompson
Ken Thompson
Ed Towe
Randy & Susan Tracy
W.A. Troutwine
Jeff Troxel
Jack Underwood
Fred Van Dyke
G. Larry Vinson
Doug Vivian
Dave Vogel
P.Y. Waggoner
Francis Walcott, Jr.
Linda Waller
Jeremy Walter
Ron Wambeke
Pauline L. Wambolt
Vern Waples
Billy Watson
Jeremiah Watson
Eric Webb
Patrick Weichel
George A. Weldon
Marjorie & Ronald West
David A. Weyler
Inez & John White
Lauraleah Wiggs
Steve Williams
Bill Wilson
Randolph Wood
Ted Woodward
Duane Yalbomski
Edith & Kathleen Yapuncich
John Yashinski
Kent Young
Susan P. Young
Bob Zager
John Zaversnik
Bob & Patricia Zellar

6.3 Public and Agency Comment on DEIS

The DEIS was submitted to the public and agencies on May 26, 1989 for review and comment. The comment period extended from May 26 through July 10, 1989. Two workshops and public meetings were held during this period on June 19 in Red Lodge, and June 21 in Billings to solicit comment on the DEIS. The following sections list the persons and agencies who provided comment on the DEIS during the comment period.

6.3.1 Written Comments

Don Bachman, Greater Yellowstone Coalition, Bozeman, MT
Donald B. Basko, Oil and Gas Conservation Commission, State of Wyoming
Alice Frell Benitez, Rocky Mountain Oil and Gas Association, Denver, CO
Patricia Bradley
B.W. Brannick
Leo Bratsky
David E. Clapp, USDHHS, Atlanta, GA
Nancy and Jim Coates
Commission Chairperson, Carbon County Board of Commissioners
Tom Croft
Lee Fears, Montana Wildlife Federation, Red Lodge, MT
Sherry Fears
Wanda Feimer
Daniel M. Frank
Ron and Carolyn Gerondale
Gary B. Glass, Geological Survey of Wyoming

Richard J. Gooby, USDA-SCS, Bozeman, MT
George S. Harger
Dennis Hemmer, Department of Environmental Quality, State of WY
Sheryl Jeffries, Office of the Governor, State of Wyoming
Gary L. Lay
Frances Main
Scott F. Mann
Ron Marcoux, Montana Department of Fish, Wildlife, and Parks, Helena, MT
Kemper McMaster, USDI-Fish and Wildlife Service, Helena, MT
Lois Nichol
S.H. Oden, Phillips Petroleum Company, Casper, WY
Barbara H. Richards, USDHUD, Denver, CO
Claude L. Richardson
Dr. and Trudy Shunk
Peg Smith
Richard A. Strait, USDI-NPS, Denver, CO
Wilburn Thompson
Jeff Troxel
John Yashinski

6.3.2 Verbal Comments, Red Lodge Public Meeting

Mr. Evans
Bill Fields
Don Monahan
Jack Steinmasel
Mr. Prankee

6.3.3 Verbal Comments, Billings Public Meeting

Don Bachman
Paul Berg
Dan Frank
Norman Frisbee
James Phelps
Vernon Sundberg
Ron Wambeke

6.4 LIST OF PREPARERS

Table 6-1 lists the principal preparers involved with writing and producing this EIS;

Table 6-2 lists members of the FS technical review team.

Table 6-1. List of Principal Preparers

Name	Responsibility	Qualifications
Forest Service		
Phil Jaquith	FS Project Coordinator	BS Forest Management; MS Silviculture; 31 years FS; 16 years District Ranger
George Weldon	FS Project Coordinator	BS Forest Management; 12 years FS-District Resource Assistant for minerals
Linda Ward-Williams	*FS Project Coordinator*	*BA, MA Anthropology; 2 industry; 11 years Bureau of Reclamation, BLM, and FS*
Bureau of Land Management		
Ed Giebel	BLM Project Coordinator	BS Agricultural Education; 31 years in resource management with the BLM, including 15 years oil and gas exploration and development
Bill McIlvain	Billings Resource Area Manager	BS Agronomy; MS Forest and Range Management; 29 years with the BLM; 15 years BLM Resource Area Manager
Phillips Petroleum Company		
Renee Taylor	Senior Regulatory and Environmental Representative	BS Wildlife Ecology and Range Conservation; post-graduate work in population ecology; 10 years industry
Ed Hasely	*Environmental Engineer*	*BS Petroleum and Natural Gas Engineering; 8 years industry*

Table 6-1. Continued.

Name	Responsibility	Qualifications
Consultant Interdisciplinary Team		
Gary Holsan	Interdisciplinary Team Leader; Project Manager; Health and Safety; Field Development	BS Forest and Range Management; 15 years FS; 8 years industry
Oliver John Grah	Assistant Project Manager; Soil Resources; Water Resources; Vegetation Resources; Air Quality; Geology; Transportation; Reclamation; Document Production	BS Botany, minor in Geology; MS Watershed Science; 3 years post-graduate work in soils; 2 years FS; 12 years industry
Larry Hayden-Wing	Wildlife; Biological Evaluation	BS Forestry/Wildlife; MS Wildlife Management; PhD Wildlife Ecology; 25 years industry
Craig Johnson	Visual Resources	BS Landscape Architecture; MS Landscape Architecture; 23 years industry
John Senulis	Cultural Resources	BA Anthropology; MA Anthropology; 25 years industry
Richard Krannich	Recreation; Sociology	BA Sociology; MS Sociology; PhD Sociology; 12 years industry
Steve Daniels	Economics	PhD Economics; 5 years industry
Paul A. Reid	Engineering/ Surveying	Registered Professional Land Surveyor; 15 years industry

Table 6-1. Continued.

Name	Responsibility	Qualifications
Consultant Interdisciplinary Team, Continued		
John Hibsman	Engineering	BS Civil Engineering; 20 years industry
Patrick Meyer	*Cartography*	*BS Geography; 4 years industry*
Karen Matsumoto	Editing; Technical Writing; Document Production, Quality Control	BS Wildlife Resources; MS Instructional Design and Development; 2 years postgraduate work in natural resources; 8 years industry
Karri Smith	*Technical Review and Assistance, Quality Control*	*BS Animal Science; MS Forestry; 3 years industry*

Table 6-2. Members of the Forest Service Technical Review Team

Name	Responsibility
Larry Potts	NEPA
Barry Burkardt	Minerals
Carl Wolf	Lands
John Edwards	Wildlife/Fish
Linda Ward-Williams	Recreation/Cultural/ Socioeconomics
Lee McConnel	Soils/Air/Water
Dave Lee	Engineering
Pat Pierson	Resource Coordination

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GLOSSARY
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ABBREVIATIONS

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ACCUMULATOR - A vessel or tank used to receive and temporarily store a liquid used in a continuous process in a plant. For example, absorption oil may be stored in an accumulator for a short time before it is returned to the absorber. On a drilling rig, the accumulator stores hydraulic fluid under pressure from compressed nitrogen or air for closing the blowout preventer in an emergency.

ACIDIZE - To treat oil-bearing limestone or other formations, using a chemical reaction with acid, to increase production. Hydrochloric or other acid is injected into the formation under pressure. The acid etches the rock, enlarging the pore spaces and passages through which the reservoir fluids flow. The acid is held under pressure for a period of time and then pumped out, and the well is swabbed and put back into production. Chemical inhibitors combined with the acid prevent corrosion of the pipe.

ACRE-FOOT - A volume of water that covers an area of 1 acre to a depth of 1 foot (43,560 cubic feet).

AFTERSHOCK - An earthquake which follows a large earthquake and originates at or near the focus of the large earthquake.

AIRSHED - A geographic area that shares the same air because of topography, meteorology, and climate.

ALLOTMENT - An area of land where one or more permittees graze their livestock. Generally consists of public land but may include parcels of private or state lands. The number of livestock and season of use are stipulated for each allotment. An allotment may consist of several pastures or be only one pasture.

ALLUVIAL BENCH - A relatively flat-surfaced landform consisting of stream deposited earth materials generally positioned adjacent to a stream.

ALLUVIAL FAN - A sloping, fan-shaped mass of sediment deposited by a stream or drainageway where it emerges from a mountain front onto a plain.

ALLUVIUM - A general term for all detrital deposits resulting from the operations of modern rivers, thus including the sediment laid down in riverbeds, floodplains, lakes, fans at the foot of mountain slopes, and estuaries.

ALKALI - Any soluble mineral salt or mixture of salts found in soils, as in some deserts, and capable of neutralizing acids.

ANIMAL UNIT MONTH (AUM) - The amount of forage necessary for the sustenance of a 1,000-lb dry cow in maintenance or gestation or five sheep for 1 month.

ANNULAR BLOWOUT PREVENTER - A large valve, usually installed above the ram preventers, which forms a seal in the space between the pipe and wellbore or, if no pipe is present, on the wellbore itself.

ARCHAEOLOGICAL RESOURCES - All prehistoric and historic physical evidence of past human activity which can be used to reconstruct lifeways and cultural history of past peoples. There include sites, artifacts, environmental data, and all other relevant information and the contexts in which they occur.

GLOSSARY

AREAS OF CRITICAL ENVIRONMENTAL CONCERN (ACEC) - Areas within the public lands (BLM) where species management attention is required (when such areas are developed or used or where no development is required) to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources or other natural systems or processes, or to protect life and safety from natural hazards.

ARTESIAN - Groundwater which is under sufficient pressure (always greater than atmospheric) to rise above the top of the aquifer when tapped by a well.

ARTIFACT - Any object made, modified, or used by humans, usually movable. Objects which are recorded as prehistoric or historic artifacts have sociocultural or scientific values and meet the general criterion of being more than 50 years old.

AQUIFER - A water-bearing bed or layer of permeable rock, sand, or gravel, capable of yielding water.

BLOWOUT - An uncontrolled flow of gas, oil, or other well fluids into the atmosphere. A blowout, or gusher, occurs when formation pressure exceeds the pressure applied to it by the column of drilling fluid. A kick warns of an impending blowout.

BLOWOUT PREVENTER - One of several valves installed at the wellhead to prevent the escape of pressure either in the annular space between the casing and drill pipe or in open hole (i.e., hole with no drill pipe) during drilling or completion operations. Blowout preventers on land rigs are located beneath the rig at the land's surface; on jackup or platform rigs, they are located at the water's surface; and on floating offshore rigs, on the sea floor.

BOTTOM HOLE - Refers to the lowest or deepest part of a well.

BOILER - Steam-generated heat for pits, rig floor, doghouse, BOPs, to keep critical components warm or from freezing-up.

BOP - Blowout preventer.

BULK MUD-COMPONENTS STORAGE - Area designated for storage of dry mud materials.

CASING - Steel pipe placed in an oil or gas well as drilling progresses to prevent the wall of the hole from caving in during drilling and to provide a means of extracting hydrocarbons if the well is productive.

CEMENTING - The application of a liquid slurry of cement and water to various points inside or outside the casing.

CHOKE HOUSE - Enclosure used to protect the valve used in restricting the flow of mud when circulating out a kick.

CHRISTMAS TREE - The control valves, pressure gauges, and chokes assembled at the top of a well to control the flow of oil and gas after the well has been drilled and completed.

COATING - A field operation for preparing a pipeline to be lowered into the ditch. The line is coated with an inert material, then spiral-wrapped with a tough, inert wrapper. Machines ride the pipe, and coat and wrap in one continuous operation. This process protects the pipeline from corrosion. For some pipeline jobs the pipe may be coated and wrapped at a mill or construction yard site. Any damage to the coating from transportation or handling can be corrected before the pipe is installed.

GLOSSARY

COLLUVIUM - A general term applied to loose and incoherent deposits, usually at the foot of a slope or cliff and brought there chiefly by gravity. Talus and cliff debris are included in such deposits.

COMMON NATURAL TO MAN DOMINATED - Where moderate levels of scenic quality which appear undisturbed by human activity (retention, partial retention, or modification, common variety class) are lowered in quality to modification or maximum modification because of the visible nature o the man induced mix.

COMMON NATURAL TO MAN NATURAL MIX - Where moderate levels of scenic quality which appear undisturbed by human activity (retention, partial retention, or modification, common variety class) are lowered in class to modification because of the visible nature of the man-induced disturbance.

COMMUNITY - An aggregate of organisms that form a distinct ecological unit. Such a unity may be defined in terms of plants, animals, or both.

CONCENTRATED RECREATION - Recreational use in any given area involving a high density of users, such as auto racing, visitor centers, etc.

CONIFER - Cone bearing trees such as pine, spruce, and fir.

COVER - The material covering the soil and providing protection from, or resistance to, the impact of raindrops and the energy of overland flow, and expressed in percent of the area covered. Composed of vegetation, litter, small rock, and large rocks. These may be lying on or within 20 feet of the ground surface.

CRITICAL WILDLIFE HABITAT - That portion of wildlife habitat that is essential to the survival and perpetuation of threatened and endangered species as designated by the U.S. Fish and Wildlife Service.

CULTURAL RESOURCES - Remains of human activity, occupation, or endeavor, as reflected in sites, buildings, artifacts, ruins, etc.

CUTTINGS - Fragments of rock dislodged by the bit and brought to the surface in the drilling mud.

DESIGNATED CORRIDOR - A linear area of land with defined and recognized boundaries identified and designated by legal public notice.

DEWATERING - The act of removing water.

DEVELOPED RECREATION SITE - Relatively small, distinctly defined area where facilities are provided for concentrated public use, i.e., campgrounds, picnic areas, swimming areas.

DIRECTIONAL DRILLING - Although wellbores are normally planned to be drilled vertically, many occasions arise when it is necessary or advantageous to drill at an angle from the vertical. Controlled directional drilling makes it possible to reach subsurface points laterally remote from the point where the bit enters the earth.

DISPERSED RECREATION - Camping in undeveloped sites and informal daytime recreation.

DISSOLVED SOLIDS - The total amount of dissolved material, organic and inorganic, contained in water or wastes.

DOGHOUSE - A small house located on the rig floor or nearby and used as an office for the driller and as a storage place for small items.

DRILL BIT - The cutting or boring element used in drilling oil and gas wells. Most bits used in rotary drilling are roller-cone bits. The bit consists of the cutting element and the circulating element.

DRILLING RIG - The derrick, draw-works and attendant surface equipment of a drilling or workover unit.

DRILLING - The operation of boring a hole in the earth, usually for the purpose of finding and removing subsurface formation fluids such as oil and gas.

DRILLING FLUID - The circulating fluid used to bring cuttings out of the wellbore.

DRILLING STRING - The column, or string, of drill pipe with attached tool joints that transmits fluid and rotational power from the kelly to the drill collars and bit. Often, the term is loosely applied to include both drill pipe and drill collars.

DRILLING FLUID - Circulating fluid, one function of which is to force cuttings out of the wellbore and to the surface. While a mixture of clay, water, and other chemical additives is the most common drilling fluid, wells can also be drilled using air, gas, or water as the drilling fluid. Also called Circulating Fluid and Mud.

ECOSYSTEM - Collectively, all populations in a community, plus the associated environmental factors.

ECOTONE - Transition area between two contrasting community types or contrasting natural features.

ECOTYPE - A distinct population of organisms within a species that has adapted genetically to its local habitat.

EFFLUENT - A discharge of pollutants into the environment, partially or completely treated or in its natural state. Generally used in regard to discharges into waters.

ENDANGERED ANIMAL SPECIES - Any animal species in danger of extinction throughout all or a significant portion of its range. This definition excludes species of insects that the Secretary of the Interior determines to be pests and whose protection under the Endangered Species Act of 1973 would present an overwhelming and overriding risk to man.

ENDANGERED PLANT SPECIES - Species of plants in danger of extinction throughout all or a significant portion of their ranges. Existence may be endangered because of the destruction, drastic change, or severe curtailment of habitat, or because of over exploitation, disease, predation, or even unknown reasons. Plant taxa from very limited areas (e.g. the type localities only), or from restricted fragile habitats usually are considered endangered.

EROSION - The removal, detachment, and entrainment of earth materials by weathering, dissolution, abrasion, and corrosion, later to be transported by moving water, wind, gravity, or glaciers.

EXISTING VISUAL CONDITION (EVC) - The present state of visual alternation of the natural-appearing landscape by man-made objects. Five classes: (1) Untouched, (2) Unnoticed, (3) Minor Disturbance, (4) Disturbed (5) Major Disturbance.

EPHEMERAL STREAM - A stream that flows only in direct response to precipitation in the immediate watershed or in response to the melting of a cover of snow and ice and which has a channel bottom that is always above the local water table.

FAULT - A fracture in rock or strata along which two sides have been displaced relative to one another parallel to the fracture.

FAUNA - The animals of a specified region or time.

FIELD - A geographical area in which a number of oil or gas wells produce from a continuous reservoir. The term generally refers to the surface area, although at times it may refer to both the surface and the underground productive formations. In a single field there may be several separate reservoirs at varying depths.

FLARE - An arrangement of piping and a burner to dispose of surplus combustible vapors, usually situated around a gasoline plant, refinery, or producing well.

FLOODPLAIN - The flat ground along a stream covered by water at the flood stage.

FLORA - The plants of a specified region or time.

FORAGE - Vegetation of all forms available for animal consumption.

FORB - A broad-leafed flowering herb other than grass.

FORMATION FRACTURING - A method of stimulating hydrocarbon production by increasing the permeability of the producing formation. Under extremely high hydraulic pressure, a fluid (e.g., water, oil, alcohol, dilute hydrochloric acid, liquefied petroleum gas, or foam) is pumped downward through tubing or drill pipe and forced into the perforations in the casing. The fluid enters the formation and parts or fractures it. Sand grains, aluminum pellets, glass beads, or similar materials are carried in suspension by the fluid into the fractures. These are called propping agents or proppants. When the pressure is released at the surface, the fracturing fluid returns to the well, and the fractures partially close on the proppants, leaving channels for hydrocarbons to flow through them to the well. This process is often called a "frac job".

FUEL TANKS - Fuel storage.

FUGITIVE DUST - Airborne particulate matter composed of soil resulting from industrial activity.

GABION - Rectangular or cylindrical wire mesh cage filled with rock and used for protecting aprons, revetments, etc. against erosion, and for slope stabilization.

GLACIATION - Alteration of the earth's solid surface through erosion and deposition by glacier ice.

GRAMINOID - Herbaceous vegetation species exhibiting grass-like appearance (i.e., sedges, rushes, grasses, etc).

GROUNDWATER - Liquid water occurring below the land surface in soil and rock.

HABITAT - A specific set of physical conditions that surround a single species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and living space.

HACK SITE - A man-made resting area for peregrine falcons.

HEAD - Pressure of a fluid upon a unit area due to the height at which the surface of the fluid stands above the point where the pressure is determined.

HISTORIC RESOURCES - All evidences of human activity that date from historic (recorded history) periods.

HYDROCARBONS - Organic compounds of hydrogen and carbon, whose densities, boiling points, and freezing points increase as their molecular weights increase. Although composed only of carbon and hydrogen, hydrocarbons exist in a great variety of compounds, owing to the strong affinity of the carbon atom for other atoms and for itself. The smallest molecules are gaseous; the largest are solids. Petroleum is a mixture of many different hydrocarbons.

IMPACT - The results of an action on the environment; the impact may be primary (direct) or secondary (indirect).

INTERMITTENT STREAM - A stream or reach of a stream that drains a watershed of at least one square mile; or a stream or reach of a stream that is below the local water table for at least some part of the year, and obtains its flow from both surface runoff and groundwater discharge.

INTERMEDIATE CASING STRING - The string of casing set in a well after the surface casing, but before the production casing, to keep the hole from caving and to seal off troublesome formations. The string is sometimes called protection casing.

INVERTEBRATE - Any animal that lacks a backbone.

JUNK RACK - An area of location, usually enclosed by a bin, which is used to store various components not needed after rigging-up is completed.

KICK - An entry of water, gas, oil, or other formation fluid into the wellbore. It occurs because the pressure exerted by the column of drilling fluid is not great enough to overcome the pressure exerted by the fluids in the formation drilled. If prompt action is not taken to control the kick or kill the well, a blowout will occur. See Blowout.

LARVAE - An insect in its earliest stage of development, after it has hatched and before it is changed into a pupae.

LEK - A courtship/breeding ground for sage grouse.

MAN NATURAL MIX TO MAN DOMINATED - Where moderate levels of scenic quality (partial retention and modification) are lowered in quality to modification and/or maximum modification).

MANAGEMENT FRAMEWORK PLAN (MFP) - A land use plan for public lands (BLM) which provide a set of goals, objectives and constraints for a specific planning area to guide the development of detailed plans for the management of each resource.

MAST - A portable derrick capable of being erected as a unit, as distinguished from a standard derrick that cannot be raised to a working position as a unit. For transporting by land, the mast can be divided into two or more sections to avoid excessive length extending from truck beds on the highway.

MAXIMUM MODIFICATION - Management activities of vegetative and landform alteration may dominate the characteristic landscape. However, when viewed as background, the visual characteristics must be those of natural occurrences within the surrounding area or character type. When viewed as foreground or middleground, they may not appear to completely borrow from naturally established form, line, color, or texture. Alterations may also be out of scale or obtain detail which is incongruent with natural occurrences as seen in foreground or middleground.

MESIC - Characterized by, related to, or requiring a moderate amount of moisture.

MITIGATION - The abatement or reduction of an impact to the environment by: 1) avoiding a certain action or parts of an action, 2) employing certain construction measures to limit the degree of impact, 3) restoring an area to preconstruction conditions, 4) preserving or maintaining an area throughout the life of a project, or 5) replacing or providing substitute resources to the environment.

MODIFICATION - Under the modification visual quality objective, management activities may visually dominate the original characteristic landscape. However, activities of vegetation and landform alternation must borrow from naturally established form, line, color or texture so completely and at such a scale that its visual characteristics are those of natural occurrences within the surrounding area or character type. Additional parts of these activities, such as structures, roads, slash, root wads, etc., must remain visually subordinate to the present composition.

MUD - The liquid circulated through the wellbore during rotary drilling operations. In addition to its function of bringing cuttings to the surface, drilling mud cools and lubricates the bit and drill stem, protects against blowouts by controlling subsurface pressures, and deposits a mud cake on the wall of the borehole to prevent loss of fluids to the formation. Although it originally was a suspension of earth solids (especially clays) in water, the mud used in modern drilling operations is a more complex, three-phase mixture of liquids, reactive solids, and inert solids. The liquid phase may be fresh water, diesel oil, or crude oil and may contain one or more conditioners. See Drilling Fluid.

MUD PUMPS - Large, reciprocating pumps used to circulate the mud on a drilling rig. A typical mud pump is a double - or triple-acting, two-or three-cylinder, piston pump whose pistons travel in replaceable liners and are driven by a crankshaft actuated by an engine. A mud pump also may be called a "slush pump".

MUD TANK - A reservoir or tank, usually made of steel plates, through which the drilling mud is cycled to allow sand and fine sediments to settle. Additives are mixed with mud in the pit, and the fluid is temporarily stored there before being pumped back into the well.

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) - The federal law, going into effect on January 1, 1970, that 1): established a national policy for the environment, 2) requires federal agencies to become aware of the environmental ramifications of their proposed actions, 3) requires full disclosure to the public of proposed federal actions and a mechanism for public input into the federal decision-making process, and 4) requires federal agencies to prepare an environmental impact statement for every major action that would significantly affect the quality of the human environment.

NATIONAL REGISTER OF HISTORIC PLACES - A list of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, and culture.

NONCONSUMPTIVE RECREATION - Recreational use which does not involve hunting or fishing.

NONGAME SPECIES - Wildlife which is not hunted for recreational purposes.

NOXIOUS WEEDS - Officially designated undesirable or invading weedy species generally introduced into an area due to human activity.

OFF-ROAD VEHICLE (ORV)/OFF-HIGHWAY VEHICLE (OHV) - A vehicle (including four-wheel drive, trail bikes, and snowmobiles but excluding helicopters, fixed-wing aircraft, and boats) capable of traveling off-road over land, water, ice, snow, sand, marshes, and other terrain.

ONE HUNDRED YEAR STORM EVENT/FLOODPLAIN - The size storm or greater that occurs on the average once in one hundred years. The floodplain associated with the one hundred year storm event.

OROGRAPHIC - Of or related to mountains; associated with or induced by the presence of mountains.

PARTIAL RETENTION - Management activities remain visually subordinate to the characteristic landscape when managed according to the partial retention visual quality objectives.

PARTICULATES - Small particles suspended in the air and generally considered pollutants.

PAY ZONE - The producing formation.

PERENNIAL STREAM - A stream or part of a stream that flows continuously during all of the calendar year as a result of groundwater discharge or surface runoff.

PERFORATE - To pierce the casing wall and cement to provide holes through which formation fluids may enter or to provide holes in the casing so that materials may be introduced into the annuals between the casing and the wall of the perforating gun, or perforator, that fires electrically detonated bullets or shaped charges from the surface.

PERMEABILITY - Extent that a substance is open to passage or penetration, especially by fluids.

PERMITTEE (GRAZING) - A person who has livestock grazing privileges on an allotment or allotments within the resource area.

PHYSIOGRAPHY - The study of genesis and evolution of landforms.

PLAYA - The shallow central basin of a desert plain, in which water gathers after a rain and is evaporated.

PLUG - Any object or device that serves to block a hole or passageway, as a cement plug in a borehole.

POWER-GENERATING PLANT - Source of power for the drilling rig.

PRECIPITATION - As used in hydrology, precipitation is the discharge of water, in liquid or solid state, out of the atmosphere, generally upon a land or water surface.

PRESERVATION - This visual quality objective allows ecological change only. Management activities except for low visual impact are prohibited.

PROPOSED CRITICAL HABITAT - Habitat proposed to be designated or revised as critical habitat for any federally listed or proposed species.

PROPOSED SPECIES - Any species of fish, wildlife, or plant that is proposed in the *Federal Register* to be federally listed.

PUMP HOUSE - Enclosure used to protect the mud pumps.

RAM BLOWOUT PREVENTERS - A blowout preventer that uses rams to seal off pressure on a hole that is with or without pipe. It is also called a ram preventer.

RAPTOR - Living on prey; a group of carnivorous birds consisting of hawks, eagles, falcons, vultures, and owls.

RECREATION OPPORTUNITY SPECTRUM (ROS) - A method of measuring the ability of Forest Service land to meet the various types of demands imposed by a variety of recreation uses.

RECREATION RESOURCES - Formally designated areas and informal dispersed areas that are managed by federal, state and local agencies in order to preserve and further their use for play, amusement, or relaxation.

RESERVE PIT - Mud pit in which a reserve supply of drilling fluid is stored. Now the "reserve pit" is actually used as a waste pit.

RESOURCE MANAGEMENT PLAN - A plan developed prior to the Forest Plan outlining the activities and projects for a particular resource element independent of considerations for other resources. Such plans are superceded by the Forest Plan.

RETENTION - This visual quality objective provides for management activities that are not visually evident.

REVETMENT - Facing of stone or other material, either permanent or temporary, placed along the edge of a stream to stabilize the bank and to protect it from the erosive action of a stream.

RIGGING UP - Before the work of drilling can be started, but after the derrick has been built, tools and machinery must be installed. This operation, which in substance is that of getting the rig ready, is conveniently described by the driller's term "rigging up."

RIGHT-OF-ENTRY - The legal right to enter or cross the lands of another.

RIGHT-OF-WAY (ROW) - The legal right for use, occupancy, or access across land or water areas for a specified purpose or purposes.

RIPARIAN - Situated on or pertaining to the bank of a river, stream, or other body of water. Normally used to refer to the plants of all types that grow along or around springs.

RIP RAP - A foundation or erosion control devise consisting of rocks thrown together without order.

SALINE - Containing common salt or any of the salts of alkali metals or magnesium.

SCENIC NATURAL TO MAN DOMINATED - Where high level of scenic quality (preservation or retention) are lowered in quality to partial retention objective.

SCOPING - An early and open process for determining the scope of issues to be addressed in an EIS and for identifying the significant issues related to a proposed action. Scoping may involve public meetings, field interviews with representatives of agencies and interest groups, discussions with resource specialists and managers, and written comments in response to news releases, direct mailings, and articles about the proposed action and scoping meetings.

SEDIMENT - Soil or mineral transported by moving water, wind, gravity, or glaciers, and deposited in streams or other bodies of water, or on land.

SEISMIC - Pertaining to an earthquake or earth vibration, including those that are artificially induced.

SENSITIVE - Species not yet officially listed as rare under the Rare and Endangered Species Act but which are undergoing a status review or are proposed for listing according to Federal Register notices published by the Secretary of the Interior or the Secretary of Commerce or according to comparable state documents published by state officials.

SIGNIFICANT IMPACT - A meaningful standard to which an action may impact the environment. The impact may be beneficial, adverse, direct, indirect, or cumulative, and may have short-term or long-term effects.

SILT - Any earthy material composed of fine particles, smaller than sand but larger than clay, suspended in or deposited by water.

SITE (CULTURAL RESOURCES) - The physical location where past human activities or events occurred.

SOIL STOCKPILE - Piles of surface soil and rocks stored for use in site restoration after drilling is started.

SPECIAL-USE LEASE - A lease which authorizes the use of public lands for purposes not specifically authorized, or forbidden by law.

SPECIES - 1) The classification level of biological nomenclature which categorized each group of related organisms potentially capable of interbreeding; 2) the accepted level of classification to differentiate one specific type of organism from another.

SPUD IN - To begin drilling; to start the hole.

STIPULATION - A legal requirement.

SUBSIDENCE - 1) The sinking of a large part of the earth's crust; 2) Geologic movement in which there is no free side and the surface material is displaced vertically downward with little or no horizontal component.

SURFACE CASING - The first string of any consequence that goes into a well is called "surface casing" because it is set deep enough to protect the well from cave-in of loose formations that are often encountered near the surface. It is the starting point for the casing head and other fittings that will be left on the completed well.

TALUS - A collection of fallen disintegrated material which has formed a slope at the foot of a steep declivity.

THREATENED ANIMAL SPECIES - Any animal species likely to become endangered within the foreseeable future throughout all or a significant part of its range.

THREATENED PLANT SPECIES - Species of plants that are likely to become endangered within the foreseeable future throughout all or a significant portion of their ranges, including species categorized as rare, very rare, or depleted.

TOESLOPE - The most distal part of a landslide; the downslope edge of a landslide or slump.

TOPOGRAPHY - The features of the earth, including relief, vegetation, and waters.

TOPSOIL - The uppermost layers of naturally occurring soils suitable for use as a plant growth medium.

TWO-TRACK ROAD - An unimproved dirt road that randomly traverses the landscape.

VEGETATION - Plants in general or the sum total of the plant life above and below ground in an area.

VENT - An opening in a vessel, line, or pump to permit the escape of air or gas.

VERTEBRATE - Animals that have backbones.

VISUAL QUALITY OBJECTIVE, FS - A desired level of excellence based on physical and sociological characteristics of an area. Refers to degree of acceptable alteration of the characteristic landscape.

VISUAL RESOURCE MANAGEMENT CLASS, BLM - The degree of visual change that is acceptable within the characteristic landscape. It is based upon the physical and sociological characteristics of any given homogeneous area and serves as a management objective.

VISUAL RESOURCES - Visible features of the landscape including land, water, vegetation, and animals.

VISUAL SENSITIVITY LEVELS - An index of the relative degree of user interest in scenic quality and concern and attitude for existing or proposed changes in the landscape features of an area in relation to other areas in the planning unit.

VISUAL VARIETY - The diversity of landscape character. Three levels are recognized: (1) Class A - Distinctive, (2) Class B - Common, (3) Class C - Minimal.

WALK - The ramp to the side of the drilling rig where pipe is laid out to be lifted to the derrick floor by the hoisting line; any elevated walkway (as a walkway on top of a tank battery).

WATERSHED - The entire area that contributes water to a drainage system or stream.

WATER TABLE - The upper limit of the portion of ground that is wholly saturated with water.

WETLAND - Those areas that are inundated or saturated with surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

WELL LOGGING - The recording of information about subsurface geological formations. Logging methods include records kept by the driller, mud and cutting analyses, core analysis, drill stem tests, and electronic and radioactivity procedures.

WELLBORE - The hole made by the drilling bit.

WELLHEAD - The equipment used to maintain surface control of a well. It is formed of the casing head, tubing head, and valves. Also refers to various parameters as they exist at the wellhead, such as wellhead pressure, wellhead price of oil, etc.

WILDCAT - A well drilled in an area where no oil or gas production exists.

WILDLIFE - All species of mammals, birds, fish, amphibians, and reptiles found in a wild state.

WILDLIFE HABITAT - All elements of a wild animal's environment necessary for completion of its life cycle. These elements include food, cover, water, and living space.

XERIC - Pertaining to typically dry conditions as contrasted with mesic (moist), and hydric (wet) conditions.

ABBREVIATIONS

ACEC	Areas of Critical Environmental Concern
ANSI	American National Standards Institute
APD	Application for Permit to Drill
API	American Petroleum Institute
ATV	All-Terrain Vehicle
AUM	Animal Unit Month
BLM	Bureau of Land Management
$CaCO_3$	Calcium carbonate
CEQ	Council on Environmental Quality
CFS	Cubic feet per second
COE	Department of Army Corps of Engineers
DST	Drill Stem Test
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESA	Endangered Species Act
IDT	Interdisciplinary Team
FS	Forest Service
FWS	U.S. Fish and Wildlife Service
H_2S	Hydrogen sulfide
HRU	Human Resource Unit
LRMP	Land and Resource Management Plan
MP	Management Prescription
MPM	Montana Principle Meridian
MTNHP	Montana Natural Heritage Program
NACE	National Association of Corrosion Engineers
NEPA	National Environmental Policy Act
NOS	Notice of Staking
OHV	Off-highway vehicles
ORV	Off-road vehicles
OSHA	Occupational Safety and Health Administration
PSD	Prevention of Significant Deterioration Standards
RIM	Recreation Information Management
ROS	Recreation Opportunity Spectrum
ROW	Right-of-way
RN	Roaded Natural
RPA	Renewable Resources Planning Act
RVD	Recreation Visitor Day
SCS	Soil Conservation Service
SPM	Semi-Primitive Motorized
SPNM	Semi-Primitive Non-Motorized
TD	Total Depth
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USLE	Universal Soil Loss Equation
VAC	Visual Absorption Capacity
VQL	Visual Quality Level
VQO	Visual Quality Objective

APPENDICES:

Appendix A - Lease Stipulations

Appendix B - Field Development

Appendix C - Engineering Analysis:
Bridge Reconnaissance Report

Appendix D - Erosion Control, Revegetation, and Rehabilitation Plan (ERRP)

Appendix E - Contingency and Evacuation Plan

Appendix F - Biological Evaluation

Appendix G - Directional Drilling Analysis

Appendix H - Review Comments and Responses

APPENDIX A

Lease Stipulations

APPENDIX A

BUREAU OF LAND MANAGEMENT

OFFER TO LEASE AND
LEASE FOR OIL AND GAS

ORIGINAL

(Sec. 17 Noncompetitive Public Domain Lease)
Act of February 25, 1920 (41 Stat. 437), as amended (30 U.S.C 181—263)

Name
Street
City
State
Zip Code

D. R. Gaither
2337 So. 6th E.
Salt Lake City, UT 84106

M 58856
(Serial Number)

This oil and gas lease is issued for a period of ten (10) years to the above-named lessee pursuant and subject to the provisions of the Mineral Leasing Act and subject to all rules and regulations of the Secretary of the Interior now or hereafter in force, when not inconsistent with any express and specific provisions herein, which are made a part hereof.

Lands included in the lease: State: Montana County: Carbon

MMT 239

T 9 S, R 20 E, PMM
Sec 1: Lots 1,2,3,4
Sec 2: Lots 1,2,3,4, S½N½, S½
Sec 3: All
Sec 10: All
Sec 12: Lot 4, W½NW¼, SE¼NW¼, SW¼, W½SE¼
Sec 15: All
Sec 28: All
Sec 32: All
Sec 33: All
Sec 34: All

Mill 2/14

Lands in Offer are not within a known geologic structure.

Containing a total of	3978.00	acres	Annual Rental... $1 per acre or fraction thereof--1st thru 5th year $3 per acre or fraction thereof--6th and each succeeding year

This lease is issued to the successful drawee pursuant to his Simultaneous Oil and Gas application filed under 43 CFR 3112, and is subject to the provisions of that application, those specified on the reverse side hereof, and the special stipulations attached.

Effective date of lease: MAR 0 1 1984

THE UNITED STATES OF AMERICA

By Cynthia L Embretson
(Signature of Signing Officer)

Chief, Fluids Adjudication Section
(Title)

FEB 1 4 1984
(Date)

D. R. Gaither
(Signature of Offeror/Lessee)

October 21, 1983
(Date)

APPENDIX A

Sec. 1. *Rights of lessee.*—The lessee is granted the exclusive right and privilege to drill for, mine, extract, save and dispose of all the oil and gas deposits, except helium, in the lands leased, together with the right to construct and maintain thereupon, all works, buildings, plants, waterways, roads, telegraph or telephone lines, pipelines, reservoirs, tanks, pumping stations, or other structures necessary to the full enjoyment thereof, for a period of 10 years, and so long thereafter as oil or gas is produced in paying quantities, subject to any operating agreement heretofore or hereafter approved by the Secretary of the Interior, the proper duty of said agreement to govern the lands subject thereto, where inconsistent with the terms of this lease.

Sec. 2. The lessee agrees:

(a) *Bond.*—(1) To file any bond required by this lease and the current regulations and until such bond is filed not to enter on the land under this lease. (2) To maintain any bond furnished by the lessee as a condition for the issuance of this lease. (3) To furnish a bond in a sum double the amount of $2 per acre or annual rental but not less than $1,000 nor more than $10,000, upon the inclusion of any part of the leased land within the known geologic structure of a producing oil or gas field. (4) To furnish prior to beginning of drilling operations and maintain at all times thereafter as required by the lessor a bond in the penal sum of $10,000 with approved corporate surety, or with deposit of United States bonds as surety therefor, conditioned upon compliance with the terms of this lease, unless a bond in like amount is already being maintained or unless such a bond furnished by an operator of the lands is accepted. (5) Until a general lease bond is filed to furnish and maintain a bond in the penal sum of not less than $1,000 in those cases in which a bond is required by law for the protection of the owners of surface rights. In lieu of any of the bonds described herein, the lessee may file such other bond as the regulations may permit.

(b) *Cooperative or unit plan.*—Within 30 days of demand, or, if the leased land is committed to an approved unit or cooperative plan and such plan is terminated prior to the expiration of this lease, within 30 days or whatever made thereafter, to subscribe to and to operate under such reasonable cooperative or unit plan for the development and operation of the area, field, or pool, or part thereof, embracing the lands included herein as the Secretary of the Interior may then determine to be practicable and necessary or advisable, which plan shall adequately protect the rights of all parties in interest, including the United States.

(c) *Wells.*—(1) To drill and produce all wells necessary to protect the leased land from drainage by wells on lands not the property of the lessee, or lands of the United States leased at a lower royalty rate, or as to which the royalties and rentals are paid into different funds than are those of this lease; or in lieu of any part of such drilling and production, with the consent of the Director of the Geological Survey, to compensate the lessor in full each month for the estimated loss of royalty through drainage in the amount determined by said Director. (2) at the election of the lessee to drill and produce other wells in conformity with any system of well spacing or production allotments affecting the field or area in which the leased lands are situated, which is authorized and sanctioned by applicable law or by the Secretary of the Interior, and (3) promptly after due notice in writing to drill and produce such other wells as the Secretary of the Interior may reasonably require in order that the leased premises may be properly and timely developed and produced in accordance with good operating practice.

(d) *Rentals and royalties.*—(1) To pay rentals and royalties in amounts or value of production removed or sold from the leased lands as follows:

Rentals.—To pay the lessor an advance annual rental of the following rates:

(a) If the lands are wholly outside the known geologic structure of a producing oil or gas field

(i) for the first through fifth lease year, a rental of $1.00 per acre or fraction thereof

(ii) for the sixth and each succeeding year, a rental of $2.00 per acre or fraction thereof.

(b) If the lands are wholly or partly within the known geologic structure of a producing oil or gas field

(i) for the second through fifth lease year (beginning with the first lease year after 30 days notice that all or part of the land is included in such structure prior to a discovery of oil or gas on the lands leased), $2.50 per acre or fraction thereof,

(ii) for the sixth and each succeeding year, a rental of $2.50 per acre or fraction thereof,

(c) for any lease year in which this lease is committed to an approved cooperative or unit plan which includes a well capable of producing oil or gas and covers a general area that is the equivalent of producing the rental required for the respective lease years in subparagraph (b) of this section shall apply to the acreage not within a participating area.

Minimum royalty.—Commencing with the lease year beginning on or after a discovery on the leased land, to pay the lessor in lieu of rental, a minimum royalty of $1 per acre or fraction thereof at the expiration of each lease year, or the difference between the actual royalty paid during the year if less than $1 per acre, and the prescribed minimum royalty of $1 per acre; provided that if this lease is unitized, the minimum royalty shall be payable only on the participating acreage and rental shall be payable on the nonparticipating acreage in accordance with subparagraph (b)(iii) above.

Royalty on production.—(1) To pay the lessor 12½ percent royalty on the production removed or sold from the leased lands computed in accordance with the Oil and Gas Operating Regulations (30 CFR Pt. 221).

(2) It is expressly agreed that the Secretary of the Interior may establish reasonable minimum values for purposes of computing royalty on any or all oil, gas, natural gasoline, and other products obtained from gas, due consideration being given to the highest price paid for a part or for a majority of production of like quality in the same field, to the price received by the lessee, to posted prices, and to other relevant matters and, whenever appropriate, after notice and opportunity to be heard.

(3) When paid in value, such royalties on production shall be due and payable monthly on the last day of the calendar month next following the calendar month in which produced. When paid in amount of production, such royalty products shall be delivered in merchantable condition on the premises where produced without cost to lessor, unless otherwise agreed to by the parties hereto, at such times and in such tanks provided by the lessee as reasonably may be required by the lessor, but in no case shall the lessee be required to hold such royalty oil or other products in storage beyond the last day of the calendar month next following the calendar month in which produced nor be responsible or held liable for the loss or destruction of royalty oil or other products in storage from causes over which he has no control.

(4) Rentals or minimum royalties may be waived, suspended or reduced and royalties on the entire leasehold or any portion thereof segregated for royalty purposes, may be reduced if the Secretary of the Interior finds that the purpose of encouraging the greatest ultimate recovery of oil or gas and in the interest of conservation of natural resources, it is necessary, in his judgment, to do so in order to promote development, or because the lease cannot be successfully operated under the terms fixed herein.

(e) *Payments.*—Unless otherwise directed by the Secretary of the Interior, to make rental, royalty, or other payments to the lessor, to the order of the Bureau of Land Management of the places mentioned in the regulation 43 CFR 3102.2. If there is no well on the leased lands capable of producing oil or gas in paying quantities, the failure to pay rental on or before the anniversary date shall automatically terminate the lease by operation of law. However, if the time for payment falls on a day in which the proper office to receive payment is closed, payment shall be deemed timely if made on the next official working day.

(f) *Contracts for disposal of products.*—To file with the Oil and Gas Supervisor of the Geological Survey not later than 30 days after the effective date thereof any contract, or evidence of other arrangement, for the sale or disposal of oil, gas, natural gasoline, and other products of the leased land: *Provided*, That nothing in any such contract or other arrangement shall be construed as modifying any of the provisions of this lease, including, but not limited to, provisions relating to gas waste, taking royalty in kind, and the method of determining royalties due as based on minimum valuation and in accordance with the Oil and Gas Operating Regulations.

Statements, plats and reports.—At such times and in such form as the lessor may prescribe, to furnish detailed statements showing the amounts and quality of all products removed from the lease, the proceeds therefrom, and the amount used for production purposes or unavoidably lost; a plat showing development and improvements on the leased lands, and a report with respect to shutdowns, investments, depreciation reserves.

Logs.—To keep a daily drilling record, a log, or such other log as all well surveys and tests in form acceptable by the lessor of all wells drilled on leased lands, and an acceptable record of all subsurface investigations affecting said lands, and to furnish them, or copies thereof, to the lessor when required. All information obtained under this paragraph upon the request of lessee, shall not be open to inspection by the public until the expiration of the lease.

(g) *Inspection.*—To keep open at all reasonable times for the inspection of any duly authorized officer of the Department, the leased premises and all wells, improvements, machinery, and fixtures thereon and all books, accounts, maps and records relative to operations and surveys or investigations on the leased lands or under the lease. All information obtained pursuant to any such inspection, upon the request of the lessee, shall not be open to inspection by the public until the expiration of the lease.

(h) *Diligence, prevention of waste, health and safety of workmen.*—To exercise reasonable diligence in drilling and producing the wells herein provided for unless consent to suspend operations temporarily is granted by the lessor, to carry on all operations in accordance with approved methods and practice as provided in the Oil and Gas Operating Regulations, having due regard for the prevention of waste of oil or gas or damage to deposits or formations containing oil, gas, or water or to coal measures or other mineral deposits, for conservation of gas energy, for the preservation and conservation of the property for future productive operations, and for the health and safety of workmen and employees, to plug properly and effectively all wells drilled in accordance with the provisions of this lease or of any prior lease or permit upon which the right to this lease was based before abandoning the same; to carry out at expense of the lessee all reasonable orders of the lessor relative to the matters in this paragraph, and that on failure of the lessee so to do the lessor shall have the right to enter on the property and to accomplish the purpose of such orders at the lessee's cost: *Provided*, That the lessee shall not be held responsible for delays or casualties occasioned by causes beyond lessee's control.

(i) *Taxes and wages, freedom of purchase.*—To pay when due all taxes lawfully assessed and levied under the laws of the State or the United States upon improvements, oil, and gas produced from the lands hereunder, or other rights, property, or assets of the lessee, to accord all workmen and employees complete freedom of purchase, and to pay all wages due workmen and employees at least twice each month in the lawful money of the United States.

(j) *Equal Opportunity clause.*—During the performance of this contract the lessee agrees as follows:

(1) *Equal Opportunity clause.* — During the performance of this lease, the lessee agrees as follows:

(i) The lessee will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The lessee will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. The lessee agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this Equal Opportunity clause.

(2) The lessee will, in all solicitations or advertisements for employees placed by or on behalf of the lessee, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(3) The lessee will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the lessee's commitments under this Equal Opportunity clause, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The lessee will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The lessee will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, as amended, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the lessee's noncompliance with the Equal Opportunity clause of this contract or with any of the said rules, regulations, or orders, this contract may be cancelled, terminated or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, as amended, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, as amended, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The lessee will include the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of September 24, 1965, as amended, so that such provisions will be binding upon each subcontractor or vendor. The lessee will take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing such provisions including sanctions for noncompliance: *Provided, however*, That in the event the lessee becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the lessee may request the United States to enter into such litigation to protect the interests of the United States.

(k) *Assignment of oil and gas lease or interest therein.*—As required by applicable law, to file for approval by the lessor any instrument of transfer made of this lease or any interest therein, including assignments of record title, operating agreements, and subleases, working or royalty interests, within 90 days from the date of final execution thereof.

(l) *Pipelines to purchase or convey at reasonable rates, and without discrimination.*—If owner, or operator, or owner of a controlling interest in any pipeline or of any company operating the same which may be operated accessible to the oil or gas derived from lands under this lease, to accept and convey and, if a purchaser of such product is to purchase at reasonable rates and without discrimination the oil or gas of the Government or of any citizen or company not the owner of any pipeline, operating a lease or purchasing or selling oil, gas, natural gasoline, or other products under the provisions of the act, or under the provisions of the act of August 7, 1947 (61 Stat. 913, 30 U.S.C. sec. 351).

(m) *Lands patented with oil and gas deposits reserved to the United States.*—To comply with all statutory requirements and regulations thereunder, if the lands embraced herein have been or shall hereafter be disposed of under the laws reserving to the United States the deposits of oil and gas therein, subject to such conditions as are or may hereafter be provided by the laws reserving such oil or gas.

(n) *Reserved or segregated lands.*—If any of the land included in this lease is embraced in a reservation or segregated for any particular purpose, to conduct operations thereunder in conformity with such requirements as may be made by the Director, Bureau of Land Management, for the protection and use of the land for the purpose for which it was reserved or segregated, so far as may be consistent with the use of the land for the purpose of this lease which latter shall be regarded as the dominant use unless otherwise provided herein or separately stipulated.

(o) *Protection of surface, natural resources, and improvements.* The lessee agrees to take such reasonable steps as may be needed to prevent operations on the leased lands from unnecessarily: (1) causing or contributing to soil erosion or damaging crops, including forage, and timber growth thereon or on Federal or non-Federal lands in the vicinity, (2) polluting air and water, (3) damaging improvements owned by the United States or any part or, (4) destroying or removing fossils, features of prehistoric ruins, or artifacts and upon any portion of the leased lands, and to restore the surface of the leased land and access roads to their former condition, including the removal of structures as and if required. The lessor may prescribe the steps to be taken and restoration to be made with respect to the leased lands and improvements thereon whether or not owned by the United States. *Antiquities and objects of historic value.*—When American antiquities or other objects of historic or scientific interest including but not limited to historic or prehistoric ruins, fossils or artifacts are discovered in the performances of this lease, the item(s) or condition(s) will be left intact and immediately brought to the attention of the contracting officer or his authorized representative.

(p) *Overriding royalties.*—Not to create overriding royalties in excess of five percent except as otherwise authorized by the regulations.

(q) *Deliver premises in case of forfeiture.*—To deliver up to the lessor in good order and condition the land leased including all improvements which are necessary for the preservation of producing wells.

Sec. 3. The lessor reserves:

(a) *Easements and rights-of-way.*—The right to permit for joint or several use easements or rights-of-way, including easements in tunnels upon, through, or in the lands leased, occupied, or used as may be necessary or appropriate to the working of the same or other lands containing the deposits described in the act, and the treatment and shipment of products thereof by or under authority of the Government, its lessees or permittees, and for other public purposes.

(b) *Disposition of surface.*—The right to lease, sell, or otherwise dispose of the surface of the leased lands under existing law or laws hereafter enacted, insofar as said surface is not necessary for the use of the lessee in the extraction and removal of the oil and gas therein, or to dispose of any resource on such lands which will not unreasonably interfere with operations under this lease.

(c) *Monopoly and fair prices.*—Full power and authority to promulgate and enforce all orders necessary to insure the sale of the production of the leased lands to the United States and to the public at reasonable prices, to protect the interests of the United States, to prevent monopoly, and to safeguard the public welfare.

(d) *Helium.*—Pursuant to Section 1 of the act as amended, the ownership of helium and the right to extract or have it extracted from all gas produced under this lease, subject to such rules and regulations as shall be prescribed by the Secretary of the Interior. If the lessor elects to take the helium, the lessee shall deliver all or any portion of gas containing the same to the lessor, in the manner required by the lessor, at any point on the leased premises, or, if the area is served at the time of production by a gas gathering system owned or operated by the lessee, at any point in that system specified by the lessor, for extraction of the helium by such means as the lessor may provide. The residue shall be returned to the lessee, with no substantial delay in the delivery of the gas produced from the well to the owner or purchaser thereof. Save for the value of the helium extracted, the lessee shall not suffer a diminution of the value of the gas produced from the well, or loss otherwise, including any expense caused solely by the requirement of the delivery of the gas to permit the extraction of helium, for which he is not reasonably compensated. The lessor reserves the right to erect, maintain, and operate any and all extraction works necessary for extraction of helium on the leased premises. The lessee further agrees to include in any contract of sale of gas from the lands subject to this lease provisions setting forth that the lessor owns, and reserves the right to extract or have extracted, any helium in the gas sold, and that the lessor may take the gas from a pipeline carrier or any other gas gathering system and extract the helium and return the gas to the owner thereof, without delay other than that caused by the extraction process, save for the value of the helium, the owner shall not suffer any diminution of the value of the gas from which helium has been extracted, or any other loss arising from the extraction of helium, including any expense caused solely by the requirement of the delivery of the gas to permit the extraction of helium, for which he is not reasonably compensated. It is further agreed that any rights reserved vested in the lessor under this paragraph shall also run to any agent or assignee of the lessor or any purchaser of the rights of the lessor.

(e) *Taking of royalties.*—All rights pursuant to section 36 of the act to take royalties in amount or in value of production.

(f) *Casing.*—All rights pursuant to section 40 of the act to purchase casing, and lease or operate valuable water wells.

Sec. 4. *Drilling and producing restrictions.*—It is agreed that the rate of prospecting and developing and the quantity and rate of production from the lands covered by this lease shall be subject to the approval of the public interest by the Secretary of the Interior, and in the exercise of his judgment the Secretary may take into consideration, among other things, Federal laws, State laws, and regulations issued thereunder, or lawful agreements among operators regulating either drilling or production, or both. After unitization, the Secretary of the Interior, or any person, committee, or State or Federal officer or agency so authorized in the unit plan, may alter or modify from time to time, the rate of prospecting and development and the quantity and rate of production from the lands covered by this lease.

Sec. 5. *Surrender and termination of lease.*—The lessee may surrender this lease or any legal subdivision thereof by filing in the proper land office a written relinquishment, in triplicate, which shall be effective as of the date of filing subject to the continued obligation of the lessee and his surety to make payment of all accrued rentals and royalties and to place all wells on the land to be relinquished in condition for suspension or abandonment in accordance with the applicable lease terms and regulations.

Sec. 6. *Purchase of materials, etc., on termination of lease.*—Upon the expiration of this lease or the earlier termination thereof pursuant to the last preceding section, the lessee shall have the privilege of any time within a period of 90 days thereafter of removing from the premises all machinery, equipment, tools, and materials other than improvements needed for producing wells. Any materials, tools, appliances, machinery, structures, and equipment subject to removal as above provided, which are allowed to remain on the leased lands shall become the property of the lessor on expiration of the 90-day period or such extension thereof as may be granted because of adverse climatic conditions throughout said period: *Provided*, That the lessee shall remove any or all of such property where so directed by the lessor.

Sec. 7. *Proceedings in case of default.*—If the lessee shall not comply with any of the provisions of the act or the regulations thereunder or of the lease, or shall make default in the performance or observance of any of the terms hereof (except that of payment of annual rental which results in the automatic termination of the lease), and such default shall continue for a period of 30 days after service of written notice thereof by the lessor, this lease may be canceled by the Secretary of the Interior in accordance with section 31 of the act, except that if this lease covers lands known to contain valuable deposits of oil or gas, the lease may be canceled only by judicial proceedings in the manner provided in section 31 of the act, but this provision shall not be construed to prevent the exercise by the lessor of any legal or equitable remedy which the lessor might otherwise have. Upon cancellation of this lease, any casing, material, or equipment determined by the lessor to be necessary for use in plugging or preserving any well drilled on the leased land shall become the property of the lessor. A waiver of any particular cause of cancellation and forfeiture shall not prevent the cancellation and forfeiture of this lease for any other cause of cancellation and forfeiture, or for the same cause occurring at any other time.

Sec. 8. *Heirs and successors-in-interest.*—It is further agreed that each obligation hereunder shall extend to and be binding upon, and every benefit hereof shall inure to, the heirs, executors, administrators, successors, or assigns of the respective parties hereto.

Sec. 9. *Unlawful interest.*—It is also further agreed that no Member of, or Delegate to, Congress, or Resident Commissioner, after his election or appointment, or either before or after he has qualified and during his continuance in office, and that no officer, agent, or employee of the Department of the Interior, except as provided in 43 CFR 7.4(a)(1), shall be admitted to any share or part in this lease or derive any benefit that may arise therefrom, and the provisions of Sec. 3741 of the Revised Statutes of the United States, as amended (41 U.S.C. Sec. 22) and Secs. 431, 432, and 433, Title 18 U.S.C., relating to contracts, enter into and form a part of this lease so far as the same may be applicable.

LEASE STIPULATIONS

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

SURFACE DISTURBANCE NOTICE

Surface Management Agency: (name and address)	BLM District Manager: (address)
See District Manager	Miles City District Bureau of Land Management P.O. Box 940 Miles City, MT 59301

The surface management agency has reviewed existing information and planning documents and, except as noted in attached special stipulations, knows of no reason why normal exploration, development, and production cannot proceed on the leased lands. However, prior to disturbing the surface of the leased lands, the lessee should contact the surface management agency to be apprised of procedures to be followed and modifications or reclamation measures that may be necessary. Lessees must comply with the onshore oil and gas operations regulations, Operating Orders, and Notices to Lessees.

T. 9 S., R. 20 E., P.M.M.
Sec. 1: Lots 1,2,3,4
Sec. 2: Lots 1,2,3,4, S½N½, S½
Sec. 12: Lot 4, W½NW¼, SE¼NW¼, SW¼, W½SE¼
1204.00 acres

APPENDIX A

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

SURFACE DISTURBANCE NOTICE

Surface Management Agency:
(name and address)

District Ranger
Custer National Forest
Beartooth Ranger District
Route 2, Box 110
Red Lodge, MT 59068

BLM District Manager:
(address)

Miles City District
Bureau of Land Management
P.O. Box 940
Miles City, MT 59301

The surface management agency has reviewed existing information and planning documents and, except as noted in attached special stipulations knows of no reason why normal exploration, development, and production cannot proceed on the leased lands. However, prior to disturbing the surface of the leased lands, the lessee should contact the surface management agency to be apprised of procedures to be followed and modifications or reclamation measures that may be necessary. Lessees must comply with the onshore oil and gas operations regulations, Operating Orders, and Notices to Lessees.

T. 9 S., R. 20 E., P.M.M.
Sec. 3: All
Sec. 10: All
Sec. 15: All
Sec. 28: All
Sec. 32: All
Sec. 33: All
Sec. 34: All
2774.00 acres

LEASE STIPULATIONS

Form 3109–3
(June 1971)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

STIPULATION FOR LANDS UNDER JURISDICTION OF DEPARTMENT OF AGRICULTURE*

The lands embraced in this lease or permit being under the jurisdiction of the Secretary of Agriculture, the lessee or permittee hereby agrees:

(1) To conduct all operations authorized by this lease or permit with due regard for good land management, not to cut or destroy timber without first obtaining permission from the authorized representative of the Secretary of Agriculture, and to pay for all such timber cut or destroyed at the rates prescribed by such representative; to avoid unnecessary damage to improvements, timber, crops, or other cover; unless otherwise authorized by the Secretary of Agriculture, not to drill any well, carry on operations, make excavations, construct tunnels, drill, or otherwise disturb the surface of the lands within 200 feet of any building standing on the lands and whenever required, in writing, by the authorized representative of the Secretary of Agriculture to fence or fill all sump holes, ditches, and other excavations, remove or cover all debris, and so far as reasonably possible, restore the surface of the lands to their former condition, including the removal of structures as and if required, and when required by such representative to bury all pipelines below plow depth.

(2) To do all in his power to prevent and suppress forest, brush, or grass fires on the lands and in their vicinity, and to require his employees, contractors, subcontractors, and employees of contractors or subcontractors to do likewise. Unless prevented by circumstances over which he has no control, the lessee or permittee shall place his employees, contractors, subcontractors, and employees of contractors and subcontractors employed on the lands at the disposal of any authorized officer of the Department of Agriculture for the purpose of fighting forest, brush, or grass fires on or originating on the lands or on adjacent areas or caused by the negligence of the lessee or permittee or his employees, contractors, subcontractors and employees of contractors and subcontractors, with the understanding that payment for such services shall be made at rates to be determined by the authorized representative of the Secretary of Agriculture, which rates shall not be less than the current rates of pay prevailing in the vicinity for services of a similar character: *Provided*, that if the lessee or permittee, his employees, contractors, subcontractors, or employees of contractors or subcontractors, caused or could have prevented the origin or spread of said fire or fires, no payment shall be made for services so rendered.

During periods of serious fire danger to forest, brush, or grass, as may be specified by the authorized representative of the Secretary of Agriculture, the lessee or permittee shall prohibit smoking and the building of camp and lunch fires by his employees, contractors, subcontractors, and employees of contractors or subcontractors within the area involved except at established camps, and shall enforce this prohibition by all means within his power: *Provided*, that the authorized representative of the Secretary of Agriculture may designate safe places where, after all inflammable material has been cleared away, campfires may be built for the purpose of heating lunches and where, at the option of the lessee or permittee, smoking may be permitted.

The lessee or permittee shall not burn rubbish, trash, or other inflammable materials *except* with the consent of the authorized representative of the Secretary of Agriculture and shall not use explosives in such a manner as to scatter inflammable materials on the surface of the lands during the forest, brush, or grass fire season, *except* as authorized to do so or on areas approved by such representative.

The lessee or permittee shall build or construct such fire lines or do such clearing on the lands as the authorized representative of the Secretary of Agriculture decides is essential for forest, brush, and grass fire prevention which is or may be necessitated by the

* This form of stipulation may be used in connection with leases and permits issued under the Acts of February 25, 1920, as amended (30 U.S.C. 181 *et seq.*); August 7, 1947 (30 U.S.C. 351 *et seq.*); February 7, 1927, as amended (30 U.S.C. 281 *et seq.*); April 17, 1926, as amended (30 U.S.C. 271 *et seq.*); June 28, 1944 (58 Stat. 483–485); September 1, 1949 (30 U.S.C. 192c); June 30, 1950 (16 U.S.C. 508b); or under the authority of any of the Acts cited in Section 402 of the President's Reorganization Plan No. 3 of 1946 (5 U.S.C. 133y–16, Note).

exercise of the privileges authorized by this lease or permit, and shall maintain such fire tools at his headquarters or at the appropriate location on the lands as are deemed necessary by such representative.

(3) In the location, design, construction, and maintenance of all authorized works, buildings, plants, waterways, roads, telegraph or telephone lines, pipelines, reservoirs, tanks, pumping stations, or other structures or clearance, the lessee or permittee shall do all things reasonably necessary to prevent or reduce to the fullest extent scarring and erosion of the lands, pollution of the water resources and any damage to the watershed. Where construction, operation, or maintenance of any of the facilities on or connected with this lease or permit causes damage to the watershed or pollution of the water resources, the lessee or permittee agrees to repair such damage and to take such corrective measures to prevent further pollution or damage to the watershed as are deemed necessary by the authorized representative of the Secretary of Agriculture.

(4) If in the opinion of the authorized representative of the Secretary of Agriculture, the lands are valuable for watershed protection, the lessee or permittee shall provide for control of surface runoff and return the affected area to as productive condition as practicable.

(5) To pay the lessor or permitter or his tenant or the surface owner or his tenant, as the case may be, for any and all damage to or destruction of property caused by the lessee's or permittee's operations hereunder; to save and hold the lessor or permitter or the surface owner or their tenants harmless from all damage or claims for damage to persons or property resulting from the lessee's or permittee's operations under this lease or permit.

(6) To recognize existing uses and commitments, in the form of Department of Agriculture grazing, timber cutting, and special use permits, water developments, ditch, road, trail, pipeline, telephone line, and fence rights-of-way and other similar improvements, and to conduct his operations so as to interfere as little as possible with the rights and privileges granted by these permits or with other existing uses.

(7) To install and maintain cattle guards to prevent the passage of livestock in any openings made in fences by the lessee or permittee or his contractors to provide access to the lands covered by this lease or permit for automotive and other equipment.

(8) If lessee or permittee shall construct any camp on the lands, such camp shall be located at a place approved by the authorized representative of the Secretary of Agriculture, and such representative shall have authority to require that such camp be kept in a neat and sanitary condition.

(9) To comply with all federally-approved rules and regulations of the Secretary of Health, Education, and Welfare governing the emission of pollutants into the air from activities which are embraced in this lease or permit.

(10) To comply with all the rules and regulations of the Secretary of Agriculture governing the national forests or other lands under his jurisdiction which are embraced in this lease or permit.

(11) Unless otherwise authorized, prior to the beginning of operations to appoint and maintain at all times during the term of this lease or permit a local agent upon whom may be served written orders or notices respecting matters contained in this stipulation, and to inform the authorized representative of the Secretary of Agriculture, in writing, of the name and address of such agent. If a substitute agent is appointed, the lessee or permittee shall immediately so inform the said representative.

(12) To address all matters relating to this stipulation to District Ranger
Custer National Forest
at Beartooth Ranger District
Route 2, Box 110
Red Lodge, Montana 59068

who is the authorized representative of the Secretary of Agriculture, or to such other representative as may from time to time, be designated, provided that such designation shall be in writing and be delivered to the lessee or permittee or his agent.

D R Gaither
(Signature of Lessee)

GPO 884-282

LEASE STIPULATIONS

nited States Department of the Interior
Bureau of Land Management
222 North 32nd Street
Billings, Montana 59107

ADDITION TO LEASE TERMS

1. Due to the enactment of Public Law 97-78, signed by the President November 16, 1981, this lease contains an additional term specifying the rights and obligations of an oil and gas lease issued subsequent to that Act. This term merely specifies what the impact of passage of that Act has done to a Federal oil and gas lease issued on or after November 16, 1981. The additional lease term is as follows:

   Under the provisions of Public Law 97-78, this lease includes all deposits of non-gaseous hydrocarbon substances other than coal, oil shale, or gilsonite (including all vein-type solid hydrocarbons). Developing by methods not conventionally used for oil and gas extraction such as fire, flooding and including surface mining will require the lessee to submit a plan of operations and will be subject to regulations governing development by such methods when those rules are issued by the Bureau of Land Management (BLM), the Minerals Management Service (MMS), and the rules or procedures of the surface managing agency, if other than BLM. Development may proceed only if the plan of operations is approved.

APPENDIX A

UNI: STATES DEPARTMENT OF THE INTEI
Bureau of Land Management

M 58856
(Serial Number)

OIL AND GAS LEASE STIPULATIONS

CULTURAL AND PALEONTOLOGICAL RESOURCES—The Federal Surface Management Agency (SMA) is responsible for assuring that the leased lands are examined to determine if cultural resources are present and to specify mitigation measures. Prior to undertaking any surface-disturbing activities on the lands covered by this lease, the lessee or operator, unless notified to the contrary by the SMA, shall:

1. Contact the appropriate SMA to determine if a site specific cultural resource inventory is required. If an inventory is required, then;

2. Engage the services of a cultural resource specialist acceptable to the SMA to conduct a cultural resource inventory of the area of proposed surface disturbance. The operator may elect to inventory an area larger than the area of proposed disturbance to cover possible site relocation which may result from environmental or other considerations. An acceptable inventory report is to be submitted to the SMA for review and approval no later than that time when an otherwise complete application for approval of drilling or subsequent surface disturbing operation is submitted.

3. Implement mitigation measures required by the SMA. Mitigation may include the relocation of proposed lease-related activities or other protective measures such as testing salvage and recordation. Where impacts to cultural resources cannot be mitigated to the satisfaction of the SMA, surface occupancy on that area must be prohibited.

The lessee or operator shall immediately bring to the attention of the SMA any cultural or paleontological resources discovered as a result of approved operations under this lease, and not disturb such discoveries until directed to proceed by the SMA.

ENDANGERED OR THREATENED SPECIES—The SMA is responsible for assuring that the leased land is examined prior to undertaking any surface-disturbing activities to determine effects upon any plant or animal species, listed or proposed for listing as endangered or threatened, or their habitats. The findings of this examination may result in some restrictions to the operator's plans or even disallow use and occupancy that would be in violation of the Endangered Species Act of 1973 by detrimentally affecting endangered or threatened species or their habitats.

The lessee/operator may, unless notified by the authorized officer of the SMA that the examination is not necessary, conduct the examination on the leased lands at his discretion and cost. This examination must be done by or under the supervision of a qualified resources specialist approved by the SMA. An acceptable report must be provided to the SMA identifying the anticipated effects of a proposed action on endangered or threatened species or their habitats.

ESTHETICS—To maintain esthetic values, all surface-disturbing activities, semipermanent and permanent facilities may require special design including location, painting and camouflage to blend with the natural surroundings and meet the intent of the visual quality objectives of the SMA.

EROSION CONTROL—Surface disturbing activities may be prohibited during muddy and/or wet soil periods. This limitation does not apply to operation and maintenance of producing wells using authorized roads.

CONTROLLED OR LIMITED SURFACE USE STIPULATION—This stipulation may be modified by special stipulations which are hereto attached or when specifically approved in writing by the Bureau of Land Management with concurrence of the SMA. Distances and/or time periods may be made less restrictive depending on the actual onground conditions. The prospective lessee should contact the SMA for more specific locations and information regarding the restrictive nature of this stipulation.

(Continued on Reverse)

LEASE STIPULATIONS

The lessee/operator is given notice that the lands within this lease may include special areas and that such areas may contain special values, may be needed for special purposes, or may require special attention to prevent damage to surface and/or other resources. Possible special areas are identified below. Any surface use or occupancy within such special areas will be strictly controlled, or if absolutely necessary, excluded. Use or occupancy will be restricted only when the Bureau of Land Management and/or the surface management agency demonstrates the restriction necessary for the protection of such special areas and existing or planned uses. Appropriate modifications to imposed restrictions will be made for the maintenance and operations of producing oil and gas wells.

After the SMA has been advised of specific proposed surface use or occupancy on the leased lands, and on request of the lessee/operator, the Agency will furnish further data on any special areas which may include:

100 feet from the edge of the rights-of-way from highways, designated county roads and appropriate federally-owned or controlled roads and recreation trails.

500 feet, or when necessary, within the 25-year flood plain from reservoirs, lakes, and ponds and intermittent, ephemeral or small perennial streams; 1,000 feet, or when necessary, within the 100-year flood plain from larger perennial streams, rivers, and domestic water supplies.

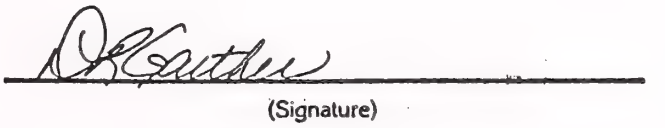
500 feet from grouse strutting grounds. Special care to avoid nesting areas associated with strutting grounds will be necessary during the period from March 1 to June 30. One-fourth mile from identified essential habitat of state and federal sensitive species. Crucial wildlife winter ranges during the period from December 1 to May 15, and in elk calving areas, during the period from May 1 to June 30.

300 feet from occupied buildings, developed recreational areas, undeveloped recreational areas receiving concentrated public use and sites eligible for or designated as National Register sites.

Seasonal road closures, roads for special uses, specified roads during heavy traffic periods and on areas having restrictive off-road vehicle designations.

On slopes over 30 percent, or 20 percent on extremely erodable or slumping soils.

October 21, 1983
(Date)


(Signature)

APPENDIX A

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Land Management

Serial No. MT 58956

Oil & Gas Lease Stipulations

The following stipulations may be modified when specifically approved in writing by the District Engineer, U.S. Geological Survey with the concurrence of the authorized officer of the surface management agency.

No Surface Occupancy Stipulation

% of Lease

) No occupancy or other activity on the surface of the following described lands is allowed under this lease: (35)

(a) T9S, R20E - Sec. 3: Portions NE¼, NW¼, SW¼, portions SE¼
Sec. 10: NW¼, portions S½
Sec. 15: Portion S½N½ & S½

(b)

Reasons for this restriction are:
(a) Steep slopes
(b)

Surface Occupancy Restriction Stipulation (by location)

% of Lease

) No _____ will be allowed within: ( )
_____ feet of _____ located within:

_____ feet of _____ located within:

_____ feet of _____ located within:

_____ feet of _____ located within:

This area contains approximately _____ total acres

Surface Occupancy Restriction Stipulation (timing)

% of Lease

) (a) In order to (~~minimize~~) (protect) wintering elk on key high use elk winter range, (67)
exploration, drilling, and development will be allowed only during: ~~the period May 16 to~~ October 14.

(b) In order to (minimize) (protect) _____
_____ will be allowed only during: _____

This does not apply to maintenance and operation of producing wells and facilities. Lands within the leased area to which this stipulation applies are described as follows:

(a) T9S, R20E - Sec. 3: E½NE¼, SE¼
Sec. 10: NE¼, portions of W½, SE¼
Sec. 15: All
Sec. 28: N½, portion SW¼, W½SE¼, portion E½SE¼
(b) Sec. 33: E½
Sec. 34: Portion W½

Road Use Stipulation

% of Lease

_____
used as an access road for activities on this lease except as follows:

October 21, 1983
Date

Signature

MT 3109-3 (December 1981)
Formerly MSO 3100-55

LEASE STIPULATIONS

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Land Management

M 58856
(Serial Number)

SPECIAL OIL AND GAS LEASE STIPULATIONS
Custer National Forest

GEOPHYSICAL OPERATIONS

Prior to entry on the leased lands for the purposes of conducting geophysical operations, the lessee must advise the District Ranger, Beartooth Ranger District, Route 2, Box 110, Red Lodge, MT 59068 and after consultation prepare an operating plan. The final plan shall be prepared in duplicate, including maps, and submitted to the District Ranger no later than 10 days prior to entry on the land for field operations.

October 21, 1983
Date

Lessee's Signature

(MT-3109-11) (April 1982)
(Formerly 3100-36)

APPENDIX A

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Land Management

M 58856

Serial No.

OIL AND GAS LEASE STIPULATIONS FOR LANDS UNDER JURISDICTION OF DEPARTMENT OF AGRICULTURE

Any or all of the following stipulations may apply to this lease and may be made less restrictive depending upon the actual onground conditions. The Forest Service (FS) and/or the Bureau of Land Management (BLM) should be contacted for details regarding the restrictive nature of these stipulations.

CULTURAL AND PALEONTOLOGICAL RESOURCES — The FS is responsible for assuring that the leased lands are examined to determine if cultural resources are present and to specify mitigation measures. Prior to undertaking any surface-disturbing activities on the lands covered by this lease, the lessee or operator, unless notified to the contrary by the FS, shall:

1. Contact BLM and the FS to determine if a site specific cultural resource inventory is recommended. If a survey is recommended, then:
2. Engage the services of a qualified cultural resource specialist acceptable to the FS to conduct an intensive inventory for evidence of cultural resource values;
3. Submit a report acceptable to the FS and BLM; and
4. Implement mitigation measures required by the FS to preserve or avoid destruction of cultural resource values. Mitigation may include relocation of proposed facilities, testing and salvage or other protective measures. All costs of the inventory and mitigation will be borne by the lessee or operator, and all data and materials salvaged will remain under the jurisdiction of the U.S. Government as appropriate.

The lessee or operator shall immediately bring to the attention of BLM or the FS any cultural or paleontological resources or any other objects of scientific interest discovered as a result of surface operations under this lease, and shall leave such discoveries intact until directed to proceed by BLM.

ENDANGERED OR THREATENED SPECIES — The FS is responsible for assuring that the leased land is examined prior to undertaking any surface-disturbing activities to determine effects upon any plant or animal species listed or proposed for listing as endangered or threatened, or their habitats. The findings of this examination may result in some restrictions to the operator's plans or even disallow use and occupancy that would be in violation of the Endangered Species Act of 1973 by detrimentally affecting endangered or threatened species or their habitats.

The lessee/operator may, unless notified by the FS that the examination is not necessary, conduct the examination on the leased lands at his discretion and cost. This examination must be done by or under the supervision of a qualified resource specialist approved by the FS. An acceptable report must be provided to the FS identifying the anticipated effects of a proposed action on endangered or threatened species or their habitats.

In order to minimize impacts on endangered or threatened species or their habitat, special conditions, such as unitization prior to approval of operations, and/or other limitations to spread surface disturbing activities over time and space may be required prior to approval and commencement of any operations on the lease.

ESTHETICS — To maintain esthetic values, all surface-disturbing activities, semipermanent and permanent facilities may require special design including location, painting and camouflage to blend with the natural surroundings and meet the intent of the visual quality objectives of the FS.

EROSION CONTROL — Surface disturbing activities may be prohibited during muddy and/or wet soil periods. This limitation does not apply to operation and maintenance of producing wells using authorized roads.

CONTROLLED OR LIMITED SURFACE USE — This stipulation may be modified by special stipulations which are hereto attached or when specifically approved in writing by BLM, with the concurrence of the FS. Distances and/or time periods may be made less restrictive depending on the actual onground conditions. The prospective lessee should contact the FS for more specific locations and information regarding the restrictive nature of this stipulation.

The lessee/operator is given notice that the lands within this lease may include special areas and that such areas may contain special values, may be needed for special purposes, or may require special attention to prevent damage to surface and/or other resources. Any surface use or occupancy within such special areas will be strictly controlled or, if absolutely necessary, excluded. Use or occupancy will be restricted only when BLM and/or the FS demonstrates that the restriction is necessary for the protection of such special areas and existing or planned uses; however, reasonable lease occupancy will not be precluded unless specified in additional stipulations attached hereto. Appropriate modifications to imposed restrictions will be made for the maintenance and operations of producing oil and gas wells.

(Continued on Reverse)

LEASE STIPULATIONS

After the FS has been advised of specific proposed surface use or occupancy on the leased lands, and on request of the lessee/operator, the FS will furnish further data on any special areas. Such restrictions may include limitations or exclusion of activities which occur within:

500 feet from perennial and ephemeral water courses and bodies, springs, flood plains, riparian areas, and water supplies;

500 feet from roads and trails, buildings and structures, sites eligible for or designated as National Register Sites or Research Natural Areas, visually sensitive areas and recreation areas including those managed for primitive recreation values;

Essential habitat of State and Federal sensitive species including wildlife, raptors, fish and plants, and crucial wildlife ranges including but not limited to: winter range from December 1 to May 15; birthing to reproduction areas (e.g. calving, fawning) from April 15 to June 30; migration routes from November 1 to December 31; spawning sites from May 1 to July 1 or appropriate from September 1 to March 30; grouse strutting grounds and nesting areas within ½ mile; and within ½ mile of raptor nests from February 1 to July 31;

Seasonal road closures, roads for special uses, specified roads during heavy traffic periods and on areas having restrictive offroad designations.

On steep slopes (over 30 to 60 percent), on slopes or soils which have a high potential for or are currently experiencing mass movement (slumps, slides, flows) or which are extremely erodable.

October 21, 1983
Date

Lessee's Signature

APPENDIX A

M-2060-a

Form 3100-11*
(March 1984)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
BILLINGS, MONTANA 59107

FORM APPROVED
OMB No. 1004-0008
Expires January 31, 1986

Serial No. M 60558

OFFER TO LEASE AND LEASE FOR OIL AND GAS

The undersigned (reverse) offers to lease all or any of the lands in item 2 that are available for lease pursuant to the Mineral Leasing Act of 1920 (30 U.S.C. 181 et seq.), the Mineral Leasing Act for Acquired Lands (30 U.S.C. 351-359), the Attorney General's Opinion of April 2, 1941 (40 OP. Atty. Gen. 41), or the

Read Instructions Before Completing

1. Name SATELLITE 8309157
Street P. O. Box 169
City, State, Zip Code Smithtown, NY 11787

FOR LESSEE

2. This offer/lease is for: (Check Only One) ☑ PUBLIC DOMAIN LANDS ☐ ACQUIRED LANDS (percent U.S. interest _____)

Surface managing agency if other than BLM: _____ Unit/Project _____

Legal description of land requested:

T. R. Meridian State County

Total acres applied for _____

Amount remitted: Filing fee $ _____ Rental fee $ _____ Total $ _____

DO NOT WRITE BELOW THIS LINE

3. Land included in lease:

T. R. Meridian State Montana County Carbon

#MT 282

T 9 S, R 20 E, PMM
Sec 4: All
Sec 9: All
Sec 22: All
Sec 27: All

Total acres in lease 2561.00

Rental retained $ 2561.00

In accordance with the above offer, or the previously submitted simultaneous oil and gas lease application or competitive bid, this lease is issued granting the exclusive right to drill for, mine, extract, remove and dispose of all the oil and gas (except helium) in the lands described in item 3 together with the right to build and maintain necessary improvements thereupon for the term indicated below, subject to renewal or extension in accordance with the appropriate leasing authority. Rights granted are subject to applicable laws, the terms, conditions, and attached stipulations of this lease, the Secretary of the Interior's regulations and formal orders in effect as of lease issuance, and to regulations and formal orders hereafter promulgated when not inconsistent with lease rights granted or specific provisions of this lease.

Type and primary term of lease:

☐ Simultaneous noncompetitive lease (ten years)
☐ Regular noncompetitive lease (ten years)
☐ Competitive lease (five years)
☐ Other _____

THE UNITED STATES OF AMERICA

By _____ (Signing Officer)

Chief, Fluids Adjudication Section (Title)

SEP 28 1984 (Date)

EFFECTIVE DATE OF LEASE OCT 1 1984

*(Formerly 3110-1, 2, 3, 3120-1, 7, 3130-4, 5, and 7)

LEASE STIPULATIONS

4. (a) Undersigned certifies that (1) offeror is a citizen of the United States; an association of such citizens; a municipality; or a corporation organized under the laws of the United States or of any State or Territory thereof; (2) all parties holding an interest in the offer are in compliance with 43 CFR 3100 and the leasing authorities; (3) offeror's chargeable interests, direct and indirect, in either public domain or acquired lands do not exceed 200,0[illegible]res in oil and gas options or 246,080 acres in options and leases [illegible] same State, or 300,000 acres in leases and 200,000 acres in options in either leasing District in Alaska; and (4) offero[illegible]t considered a minor under the laws of the State in which the [illegible] covered by this offer are located.

(b) Undersigned agrees that signature to this offer constitutes [illegible]ptance of this lease, including all terms, conditions, and stipulations of which offeror has been given notice, and any amendment or separate lease that may include any land described in this offer open to leasing at the time this offer was filed but omitted for any reason from this lease. The offeror further agrees that this offer cannot be withdrawn, either in whole or part, unless the withdrawal is received by the BLM State Office before this lease, an amendment to this lease, or a separate lease, whichever covers the land described in the withdrawal, has been signed on behalf of the United States.

This offer will be rejected and will afford offeror no priority if it is not properly completed and executed in accordance with the regulations, or if it is not accompanied by the required payments. 18 U.S.C. Sec. 1001 makes it a crime for any person knowingly and willfully to make to any Department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

Satellite 8309157

Duly executed this 15 day of August, 1984. by Jeffrey Ellis, Nominee

(Signature of Lessee or Attorney-in-fact)

LEASE TERMS

Sec. 1. Rentals—Rentals shall be paid to proper office of lessor in advance of each lease year. Annual rental rates per acre or fraction thereof are:

(a) Simultaneous noncompetitive lease, $1.00 for the first 5 years, thereafter, $3.00;
(b) Regular noncompetitive lease, $1.00;
(c) Competitive lease, $2.00; or
(d) Other, see attachment.

If all or part of a noncompetitive leasehold is determined to be within a known geological structure or a favorable petroleum geological province, annual rental shall become $2.00, beginning with the lease year following notice of such determination. However, a lease that would otherwise be subject to rental of more than $2.00 shall continue to be subject to the higher rental.

If this lease or a portion thereof is committed to an approved cooperative or unit plan which includes a well capable of producing leased resources, and the plan contains a provision for allocation of production, royalties shall be paid on the production allocated to this lease. However, annual rentals shall continue to be due at the rate specified in (a), (b), (c), or (d) for those lands not within a participating area.

Failure to pay annual rental, if due, on or before the anniversary date of this lease (or next official working day if office is closed) shall automatically terminate this lease by operation of law. Rentals may be waived, reduced, or suspended by the Secretary upon a sufficient showing by lessee.

Sec. 2. Royalties—Royalties shall be paid to proper office of lessor. Royalties shall be computed in accordance with regulations on production removed or sold. Royalty rates are:

(a) Simultaneous noncompetitive lease, 12½%;
(b) Regular noncompetitive lease, 12½%;
(c) Competitive lease, see attachment; or
(d) Other, see attachment.

Lessor reserves the right to specify whether royalty is to be paid in value or in kind, and the right to establish reasonable minimum values on products after giving lessee notice and an opportunity to be heard. When paid in value, royalties shall be due and payable on the last day of the month following the month in which production occurred. When paid in kind, production shall be delivered, unless otherwise agreed to by lessor, in merchantable condition on the premises where produced without cost to lessor. Lessee shall not be required to hold such production in storage beyond the last day of the month following the month in which production occurred, nor shall lessee be held liable for loss or destruction of royalty oil or other products in storage from causes beyond the reasonable control of lessee.

Minimum royalty shall be due for any lease year after discovery in which royalty payments aggregate less than $1.00 per acre. Lessee shall pay such difference at end of lease year. This minimum royalty may be waived, suspended, or reduced, and the above royalty rates may be reduced, for all or portions of this lease if the Secretary determines that such action is necessary to encourage the greatest ultimate recovery of the leased resources, or is otherwise justified.

An interest charge shall be assessed on late royalty payments or underpayments in accordance with the Federal Oil and Gas Royalty Management Act of 1982 (FOGRMA) (96 Stat. 2447). Lessee shall be liable for royalty payments on oil and gas lost or wasted from a lease site when such loss or waste is due to negligence on the part of the operator, or due to the failure to comply with any rule, regulation, order, or citation issued under FOGRMA or the leasing authority.

Sec. 3. Bonds—Lessee shall file and maintain any bond required under regulations.

Sec. 4. Diligence, rate of development, unitization, and drainage—Lessee shall exercise reasonable diligence in developing and producing, and shall prevent unnecessary damage to, loss of, or waste of leased resources. Lessor reserves right to specify rates of development and production in the public interest and to require lessee to subscribe to a cooperative or unit plan, within 30 days of notice, if deemed necessary for proper development and operation of area, field, or pool embracing these leased lands. Lessee shall drill and produce wells necessary to protect leased lands from drainage or pay compensatory royalty for drainage in amount determined by lessor.

Sec. 5. Documents, evidence, and inspection—Lessee shall file with proper office of lessor, not later than 30 days after effective date thereof, any contract or evidence of other arrangement for sale or disposal of production. At such times and in such form as lessor may prescribe, lessee shall furnish detailed statements showing amounts and quality of all products removed and sold, proceeds therefrom, and amount used for production purposes or unavoidably lost. Lessee may be required to provide plats and schematic diagrams showing development work and improvements, and reports with respect to parties in interest, expenditures, and depreciation costs. In the form prescribed by lessor, lessee shall keep a daily drilling record, a log, information on well surveys and tests, and a record of subsurface investigations and furnish copies to lessor when required. Lessee shall keep open at all reasonable times for inspection by any authorized officer of lessor, the leased premises and all wells, improvements, machinery, and fixtures thereon, and all books, accounts, maps, and records relative to operations, surveys, or investigations on or in the leased lands. Lessee shall maintain copies of all contracts, sales agreements, accounting records, and documentation such as billings, invoices, or similar documentation that supports costs claimed as manufacturing, preparation, and/or transportation costs. All such records shall be maintained in lessee's accounting offices for future audit by lessor. Lessee shall maintain required records for 6 years after they are generated or, if an audit or investigation is underway, until released of the obligation to maintain such records by lessor.

During existence of this lease, information obtained under this section shall be closed to inspection by the public in accordance with the Freedom of Information Act (5 U.S.C. 552).

Sec. 6. Conduct of operations—Lessee shall conduct operations in a manner that minimizes adverse impacts to the land, air, and water, to cultural, biological, visual, and other resources, and to other land uses or users. Lessee shall take reasonable measures deemed necessary by lessor to accomplish the intent of this section. To the extent consistent with lease rights granted, such measures may include, but are not limited to, modification to siting or design of facilities, timing of operations, and specification of interim and final reclamation measures. Lessor reserves the right to continue existing uses and to authorize future uses upon or in the leased lands, including the approval of easements or rights-of-ways. Such uses shall be conditioned so as to prevent unnecessary or unreasonable interference with rights of lessee.

Prior to disturbing the surface of the leased lands, lessee shall contact lessor to be apprised of procedures to be followed and modifications or reclamation measures that may be necessary. Areas to be disturbed may require inventories or special studies to determine the extent of impacts to other resources. Lessee may be required to complete minor inventories or short term special studies under guidelines provided by lessor. If in the conduct of operations, threatened or endangered species, objects of historic or scientific interest, or substantial unanticipated environmental effects are observed, lessee shall immediately contact lessor. Lessee shall cease any operations that would result in the destruction of such species or objects.

Sec. 7. Mining operations—To the extent that impacts from mining operations would be substantially different or greater than those associated with normal drilling operations, lessor reserves the right to deny approval of such operations.

Sec. 8. Extraction of helium—Lessor reserves the option of extracting or having extracted helium from gas production in a manner specified and by means provided by lessor at no expense or loss to lessee or owner of the gas. Lessee shall include in any contract or sale of gas the provisions of this section.

Sec. 9. Damages to property—Lessee shall pay lessor for damage to lessor's improvements, and shall save and hold lessor harmless from all claims for damage or harm to persons or property as a result of lease operations.

Sec. 10. Protection of diverse interests and equal opportunity—Lessee shall: pay when due all taxes legally assessed and levied under laws of the State or the United States; accord all employees complete freedom of purchase; pay all wages at least twice each month in lawful money of the United States; maintain a safe working environment in accordance with standard industry practices; and take measures necessary to protect the health and safety of the public.

Lessor reserves the right to ensure that production is sold at reasonable prices and to prevent monopoly. If lessee operates a pipeline, or owns controlling interest in a pipeline or a company operating a pipeline, which may be operated accessible to oil derived from these leased lands, lessee shall comply with section 28 of the Mineral Leasing Act of 1920.

Lessee shall comply with Executive Order No. 11246 of September 24, 1965, as amended, and regulations and relevant orders of the Secretary of Labor issued pursuant thereto. Neither lessee nor lessee's subcontractors shall maintain segregated facilities.

Sec. 11. Transfer of lease interests and relinquishment of lease—As required by regulations, lessee shall file with lessor any assignment or other transfer of an interest in this lease. Lessee may relinquish this lease or any legal subdivision by filing in the proper office a written relinquishment, which shall be effective as of the date of filing, subject to the continued obligation of the lessee and surety to pay all accrued rentals and royalties.

Sec. 12. Delivery of premises—At such time as all or portions of this lease are returned to lessor, lessee shall place affected wells in condition for suspension or abandonment, reclaim the land as specified by lessor and, within a reasonable period of time, remove equipment and improvements not deemed necessary by lessor for preservation of producible wells.

Sec. 13. Proceedings in case of default—If lessee fails to comply with any provisions of this lease, and the noncompliance continues for 30 days after written notice thereof, this lease shall be subject to cancellation. Lessee shall also be subject to applicable provisions and penalties of FOGRMA (96 Stat. 2447). However, if this lease includes land known to contain valuable deposits of leased resources, it may be cancelled only by judicial proceedings. This provision shall not be construed to prevent the exercise by lessor of any other legal and equitable remedy, including waiver of the default. Any such remedy or waiver shall not prevent later cancellation for the same default occurring at any other time.

Sec. 14. Heirs and successors-in-interest—Each obligation of this lease shall extend to and be binding upon, and every benefit hereof shall inure to the heirs, executors, administrators, successors, beneficiaries, or assignees of the respective parties hereto.

APPENDIX A

Form 3109–3
(June 1971)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

STIPULATION FOR LANDS UNDER JURISDICTION OF DEPARTMENT OF AGRICULTURE*

The lands embraced in this lease or permit being under the jurisdiction of the Secretary of Agriculture, the lessee or permittee hereby agrees:

(1) To conduct all operations authorized by this lease or permit with due regard for good land management, not to cut or destroy timber without first obtaining permission from the authorized representative of the Secretary of Agriculture, and to pay for all such timber cut or destroyed at the rates prescribed by such representative; to avoid unnecessary damage to improvements, timber, crops, or other cover; unless otherwise authorized by the Secretary of Agriculture, not to drill any well, carry on operations, make excavations, construct tunnels, drill, or otherwise disturb the surface of the lands within 200 feet of any building standing on the lands and whenever required, in writing, by the authorized representative of the Secretary of Agriculture to fence or fill all sump holes, ditches, and other excavations, remove or cover all debris, and so far as reasonably possible, restore the surface of the lands to their former condition, including the removal of structures as and if required, and when required by such representative to bury all pipelines below plow depth.

(2) To do all in his power to prevent and suppress forest, brush, or grass fires on the lands and in their vicinity, and to require his employees, contractors, subcontractors, and employees of contractors or subcontractors to do likewise. Unless prevented by circumstances over which he has no control, the lessee or permittee shall place his employees, contractors, subcontractors, and employees of contractors and subcontractors employed on the lands at the disposal of any authorized officer of the Department of Agriculture for the purpose of fighting forest, brush, or grass fires on or originating on the lands or on adjacent areas or caused by the negligence of the lessee or permittee or his employees, contractors, subcontractors and employees of contractors and subcontractors, with the understanding that payment for such services shall be made at rates to be determined by the authorized representative of the Secretary of Agriculture, which rates shall not be less than the current rates of pay prevailing in the vicinity for services of a similar character: *Provided*, that if the lessee or permittee, his employees, contractors, subcontractors, or employees of contractors or subcontractors, caused or could have prevented the origin or spread of said fire or fires, no payment shall be made for services so rendered.

During periods of serious fire danger to forest, brush, or grass, as may be specified by the authorized representative of the Secretary of Agriculture, the lessee or permittee shall prohibit smoking and the building of camp and lunch fires by his employees, contractors, subcontractors, and employees of contractors or subcontractors within the area involved except at established camps, and shall enforce this prohibition by all means within his power: *Provided*, that the authorized representative of the Secretary of Agriculture may designate safe places where, after all inflammable material has been cleared away, campfires may be built for the purpose of heating lunches and where, at the option of the lessee or permittee, smoking may be permitted.

The lessee or permittee shall not burn rubbish, trash, or other inflammable materials *except* with the consent of the authorized representative of the Secretary of Agriculture and shall not use explosives in such a manner as to scatter inflammable materials on the surface of the lands during the forest, brush, or grass fire season, *except* as authorized to do so or on areas approved by such representative.

The lessee or permittee shall build or construct such fire lines or do such clearing on the lands as the authorized representative of the Secretary of Agriculture decides is essential for forest, brush, and grass fire prevention which is or may be necessitated by the

* This form of stipulation may be used in connection with leases and permits issued under the Acts of February 25, 1920, as amended (30 U.S.C. 181 *et seq.*); August 7, 1947 (30 U.S.C. 351 *et seq.*); February 7, 1927, as amended (30 U.S.C. 281 *et seq.*); April 17, 1926, as amended (30 U.S.C. 271 *et seq.*); June 28, 1944 (58 Stat. 483–485); September 1, 1949 (30 U.S.C. 192c); June 30, 1950 (16 U.S.C. 508b); or under the authority of any of the Acts cited in Section 402 of the President's Reorganization Plan No. 3 of 1946 (5 U.S.C. 133y–16, Note).

exercise of the privileges authorized this lease or permit, and shall maintain such fire tools at his headquarters or at the appropriate location on the lands as are deemed necessary by such representative.

(3) In the location, design, construction, and maintenance of all authorized works, buildings, plants, waterways, roads, telegraph or telephone lines, pipelines, reservoirs, tanks, pumping stations, or other structures or clearance, the lessee or permittee shall do all things reasonably necessary to prevent or reduce to the fullest extent scarring and erosion of the lands, pollution of the water resources and any damage to the watershed. Where construction, operation, or maintenance of any of the facilities on or connected with this lease or permit causes damage to the watershed or pollution of the water resources, the lessee or permittee agrees to repair such damage and to take such corrective measures to prevent further pollution or damage to the watershed as are deemed necessary by the authorized representative of the Secretary of Agriculture.

(4) If in the opinion of the authorized representative of the Secretary of Agriculture, the lands are valuable for watershed protection, the lessee or permittee shall provide for control of surface runoff and return the affected area to as productive condition as practicable.

(5) To pay the lessor or permitter or his tenant or the surface owner or his tenant, as the case may be, for any and all damage to or destruction of property caused by the lessee's or permittee's operations hereunder; to save and hold the lessor or permitter or the surface owner or their tenants harmless from all damage or claims for damage to persons or property resulting from the lessee's or permittee's operations under this lease or permit.

(6) To recognize existing uses and commitments, in the form of Department of Agriculture grazing, timber cutting, and special use permits, water developments, ditch, road, trail, pipeline, telephone line, and fence rights-of-way and other similar improvements, and to conduct his operations so as to interfere as little as possible with the rights and privileges granted by these permits or with other existing uses.

(7) To install and maintain cattle guards to prevent the passage of livestock in any openings made in fences by the lessee or permittee or his contractors to provide access to the lands covered by this lease or permit for automotive and other equipment.

(8) If lessee or permittee shall construct any camp on the lands, such camp shall be located at a place approved by the authorized representative of the Secretary of Agriculture, and such representative shall have authority to require that such camp be kept in a neat and sanitary condition.

(9) To comply with all federally-approved rules and regulations of the Secretary of Health, Education, and Welfare governing the emission of pollutants into the air from activities which are embraced in this lease or permit.

(10) To comply with all the rules and regulations of the Secretary of Agriculture governing the national forests or other lands under his jurisdiction which are embraced in this lease or permit.

(11) Unless otherwise authorized, prior to the beginning of operations to appoint and maintain at all times during the term of this lease or permit a local agent upon whom may be served written orders or notices respecting matters contained in this stipulation, and to inform the authorized representative of the Secretary of Agriculture, in writing, of the name and address of such agent. If a substitute agent is appointed, the lessee or permittee shall immediately so inform the said representative.

(12) To address all matters relating to this stipulation to District Ranger
Custer National Forest
at Beartooth Ranger District
Route 2, Box 110
Red Lodge, Montana 59068

who is the authorized representative of the Secretary of Agriculture, or to such other representative as may from time to time, be designated, provided that such designation shall be in writing and be delivered to the lessee or permittee or his agent.

(Signature of Lessee)

GPO 880-282

APPENDIX A

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Land Management Serial No. M 60558

Oil & Gas Lease Stipulations

The following stipulations may be modified when specifically approved in writing by the District Engineer, U.S. Geological Survey with the concurrence of the authorized officer of the surface management agency.

No Surface Occupancy Stipulation

% of Lease

No occupancy or other activity on the surface of the following described lands is allowed under this lease: (30)

(a) T9S, R20E, PMM
Sec. 4 : Portions N½NE¼, W½W½, portion SE¼
Sec. 9 : NE¼, portions NW¼, E½SW¼, SE¼
Sec. 22: Portions S½

(b)

Reasons for this restriction are:
(a) Steep slopes. (50%)
(b)

Surface Occupancy Restriction Stipulation (by location)

% of Lease

No _____ will be allowed within: ( )
_____ feet of _____ located within:

_____ feet of _____ located within:

_____ feet of _____ located within

_____ feet of _____ located within:

This area contains approximately _____ total acres

Surface Occupancy Restriction Stipulation (timing)

% of Lease

(a) In order to (~~minimize~~) (protect) wintering elk on key high use elk winter range exploration, drilling, and development activities will be allowed only during: the period May 16 to October 14 (36)

(b) In order to (minimize) (protect) _____
_____ will be allowed only during: _____

This does not apply to maintenance and operation of producing wells and facilities. Lands within the leased area to which this stipulation applies are described as follows:
(a) T9S, R20E, PMM
Sec. 22: All
Sec. 27: N½

(b)

Road Use Stipulation

% of Lease

The _____ ( )
will not be used as an access road for activities on this lease except as follows:

_____ Date

_____ Signature

MT-3109-3 (December 1981)
Formerly MSO 3100-55

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Land Management

M 60558
(Serial No.)

ACTIVITY COORDINATION STIPULATION

This stipulation may be modified when specifically approved in writing by the District Engineer, Geological Survey with concurrence of the authorized officer of the surface management agency.

(X) This lease includes lands within key elk summer range in T9S, R20E, portions of Sections 4 and 9 (25) % of Lease

which has resource values sensitive to high levels of activity. In order to minumize impacts to these resources, special conditions, such as unitization prior to approval of operations, and/or other limitations to spread surface disturbance activities over time and space may be required prior to approval and commencement of any operations on the lease.

APPENDIX A

UNITE[illegible]TATES DEPARTMENT OF THE I[illegible]RIOR
Bureau of Land Management

M 60558
(Serial Number)

OIL AND GAS LEASE SPECIAL STIPULATIONS FOR CUSTER NATIONAL FOREST

GEOPHYSICAL OPERATIONS

Prior to entry on the leased lands for the purposes of conducting geophysical operations, the lessee must advise the District Ranger, Beartooth Ranger District and after consultation prepare an operating plan. The final plan shall be prepared in duplicate, including maps, and submitted to the District Ranger no later than 10 days prior to entry on the land for field operations.

Date

Lessee's Signature

LEASE STIPULATIONS

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Land Management

M 60558

Serial No.

OIL AND GAS LEASE STIPULATIONS FOR LANDS UNDER JURISDICTION OF DEPARTMENT OF AGRICULTURE

Any or all of the following stipulations may apply to this lease and may be made less restrictive depending upon the actual onground conditions. The Forest Service (FS) and/or the Bureau of Land Management (BLM) should be contacted for details regarding the restrictive nature of these stipulations.

CULTURAL AND PALEONTOLOGICAL RESOURCES — The FS is responsible for assuring that the leased lands are examined to determine if cultural resources are present and to specify mitigation measures. Prior to undertaking any surface-disturbing activities on the lands covered by this lease, the lessee or operator, unless notified to the contrary by the FS, shall:

1. Contact BLM and the FS to determine if a site specific cultural resource inventory is recommended. If a survey is recommended, then:

2. Engage the services of a qualified cultural resource specialist acceptable to the FS to conduct an intensive inventory for evidence of cultural resource values;

3. Submit a report acceptable to the FS and BLM; and

4. Implement mitigation measures required by the FS to preserve or avoid destruction of cultural resource values. Mitigation may include relocation of proposed facilities, testing and salvage or other protective measures. All costs of the inventory and mitigation will be borne by the lessee or operator, and all data and materials salvaged will remain under the jurisdiction of the U.S. Government as appropriate.

The lessee or operator shall immediately bring to the attention of BLM or the FS any cultural or paleontological resources or any other objects of scientific interest discovered as a result of surface operations under this lease, and shall leave such discoveries intact until directed to proceed by BLM.

ENDANGERED OR THREATENED SPECIES — The FS is responsible for assuring that the leased land is examined prior to undertaking any surface-disturbing activities to determine effects upon any plant or animal species listed or proposed for listing as endangered or threatened, or their habitats. The findings of this examination may result in some restrictions to the operator's plans or even disallow use and occupancy that would be in violation of the Endangered Species Act of 1973 by detrimentally affecting endangered or threatened species or their habitats.

The lessee/operator may, unless notified by the FS that the examination is not necessary, conduct the examination on the leased lands at his discretion and cost. This examination must be done by or under the supervision of a qualified resource specialist approved by the FS. An acceptable report must be provided to the FS identifying the anticipated effects of a proposed action on endangered or threatened species or their habitats.

In order to minimize impacts on endangered or threatened species or their habitat, special conditions, such as unitization prior to approval of operations, and/or other limitations to spread surface disturbing activities over time and space may be required prior to approval and commencement of any operations on the lease.

ESTHETICS — To maintain esthetic values, all surface-disturbing activities, semipermanent and permanent facilities may require special design including location, painting and camouflage to blend with the natural surroundings and meet the intent of the visual quality objectives of the FS.

EROSION CONTROL — Surface disturbing activities may be prohibited during muddy and/or wet soil periods. This limitation does not apply to operation and maintenance of producing wells using authorized roads.

CONTROLLED OR LIMITED SURFACE USE — This stipulation may be modified by special stipulations which are hereto attached or when specifically approved in writing by BLM, with the concurrence of the FS. Distances and/or time periods may be made less restrictive depending on the actual onground conditions. The prospective lessee should contact the FS for more specific locations and information regarding the restrictive nature of this stipulation.

The lessee/operator is given notice that the lands within this lease may include special areas and that such areas may contain special values, may be needed for special purposes, or may require special attention to prevent damage to surface and/or other resources. Any surface use or occupancy within such special areas will be strictly controlled or, if absolutely necessary, excluded. Use or occupancy will be restricted only when BLM and/or the FS demonstrates that the restriction is necessary for the protection of such special areas and existing or planned uses; however, reasonable lease occupancy will not be precluded unless specified in additional stipulations attached hereto. Appropriate modifications to imposed restrictions will be made for the maintenance and operations of producing oil and gas wells.

(Continued on Reverse)

APPENDIX A

After the FS has been advised of specific pro, ·.d surface use or occupancy on the leased lands, ɛ ɔn request of the lessee/operator, the FS will furnish further data on any special areas. Such restrictions may include limitations or exclusion of activities which occur within:

500 feet from perennial and ephemeral water courses and bodies, springs, flood plains, riparian areas, and water supplies;

500 feet from roads and trails, buildings and structures, sites eligible for or designated as National Register Sites or Research Natural Areas, visually sensitive areas and recreation areas including those managed for primitive recreation values;

Essential habitat of State and Federal sensitive species including wildlife, raptors, fish and plants, and crucial wildlife ranges including but not limited to: winter range from December 1 to May 15; birthing to reproduction areas (e.g. calving, fawning) from April 15 to June 30; migration routes from November 1 to December 31; spawning sites from May 1 to July 1 or appropriate from September 1 to March 30; grouse strutting grounds and nesting areas within ½ mile; and within ½ mile of raptor nests from February 1 to July 31;

Seasonal road closures, roads for special uses, specified roads during heavy traffic periods and on areas having restrictive offroad designations;

On steep slopes (over 30 to 60 percent), on slopes or soils which have a high potential for or are currently experiencing mass movement (slumps, slides, flows) or which are extremely erodable.

_____ _____

Date Lessee's Signature

LEASE STIPULATIONS

1-060626-a

UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF LAND MANAGEMENT OIL AND GAS LEASE AMENDMENT	Serial Number M 60558 Effective Date of Lease October 1, 1984 Amendment Issued Effective October 1, 1985

Pursuant to the provision of P.L. 97-451 (76 Stat. 2447) the lessee agrees to new lease terms increasing rental and royalty rates as follows:

Rental of $5 per acre, or fraction of an acre, per year.

Royalty at a rate of 16-2/3%.

This amendment, to be attached to and made a part of the lease, is effective as of the date shown above.

PHILLIPS PETROLEUM COMPANY

By: D. Hunt

D. Hunt Lessee
Attorney-in-Fact

January 3, 1986
Date

The UNITED STATES OF AMERICA

By Karen L. Skauge
Signature of Signing Officer

Chief, Leasing Unit
Title

January 31, 1986
Date

APPENDIX B

Field Development

APPENDIX B

Field Development

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FIELD DEVELOPMENT

INTRODUCTION

Chapter 1 of the Phillips Ruby A Federal No. 1-9 Exploratory Oil/Gas Well Environmental Impact Statement (EIS) states that Phillips Petroleum Company (Phillips) is requesting federal and state approvals for drilling a single exploratory oil/gas well, testing of hydrocarbon bearing formations, and reclamation and abandonment of the drill site.

Further exploration and/or field development and its associated impacts to various resource values in the project area were identified as an important issue during the scoping process for the proposed action. There were public concerns regarding drilling of this well and the potential affects of additional wells and associated oil/gas production facilities along the east face of the Line Creek Plateau. The main concern was that impacts could result in possible disruption of significant scenic and wildlife resources, important to recreationists and the tourist-based economy of the Red Lodge area.

This appendix discusses the reasonably foreseeable possibilities and associated limitations of future development proposals that could occur if the exploratory drilling program successfully discovers commercial quantities of oil and/or gas. The field development scenario proposed by Phillips covers the probability of discovery, the stages of field development likely to be associated with the Phillips proposal, potential impacts to the various resource disciplines in the field area, and the technical and environmental review process. The information provided in this appendix was developed in response to public concerns regarding the potential affects of additional wells and associated oil/gas production facilities along the east face of the Line Creek Plateau. The information is also intended to provide a basic understanding of what could be involved in developing the prospect and the possible impacts to the various resources that could occur if field development were to proceed. Mitigation needed to avoid or minimize these potential impacts is provided with the discussion of impacts.

PROBABILITY OF DISCOVERY

The Phillips Ruby A Federal No. 1-9 Prospect is the first drilling attempt on the east face of the Line Creek Plateau. Other drilling attempts have occurred along the east edge of the Beartooth Plateau and east of the Line Creek Plateau along the valley floor. The drilling attempt is projected to reach a directionally drilled total depth of 12,500 feet, with a true vertical drill depth of 11,600 feet. Primary objectives include the Cretaceous Frontier Sandstone, Permian Phosphoria Formation, and Pennsylvanian Tensleep Sandstone. Secondary objectives include Cretaceous Dakota Sandstone, Mississippian Madison Limestone, and Ordovician Bighorn Dolomite. These formations have combined to produce over 500 million barrels of oil at the Elk Basin Field located about 17 miles to the southeast of the project area. The targeted structure associated with the Phillips proposal is a north-south trending feature, known as the Ruby structure, identified in the subsurface using seismic data that was integrated with limited well control from other drilling attempts in the vicinity.

APPENDIX B

Phillips has formed a 13,660 acre federal unit known as the Ruby Unit. This Unit was approved by the BLM on May 31, 1989. Operation of the Unit Area is authorized by a Unit Agreement between lease holders within the Unit Area. Terms of the Unit Agreement designate Phillips as the Unit Operator. Assignment as the Ruby Unit Operator implies that Phillips consents to accept the duties and obligations for discovery, development, and protection of gas and/or oil reserves within the Ruby Unit Area, should they occur.

The Ruby A Federal Prospect is classified as a wildcat well since it would be drilled in the unproven territory of the *Ruby Unit*. Nationally, during the years 1980 through 1984, approximately 28 percent of all exploratory wells successfully encountered oil and gas (U.S. Energy Information Administration 1984). During the same period, the success rate in Montana was approximately 27 percent. These statistics include all exploration wells and probably overestimate the chance of success for a wildcat well. As a result, there is a high probability that the proposed Ruby A Federal Prospect would not encounter hydrocarbons in producible quantities.

Chapter 2 of the EIS discussed other drilling attempts that have occurred along the east edge of the Beartooth Plateau in Montana and Wyoming near the Ruby A Federal No. 1-9 Prospect. The locations of these tests are shown on Exhibit B-1. Information regarding the results of these drilling attempts are summarized in the following paragraphs.

The Amoco Unit #1A site is located about five miles northwest of the Ruby A Federal No. 1-9 Prospect in the southwest quarter of the southwest quarter of Section 19, Township 8 South, Range 20 East (SW1/4 SE1/4 of Sec 19 T8S R20E). Drilling started on this well in September 1986 and was temporarily abandoned in April 1987. The borehole was re-entered in September 1987 and was abandoned in April 1988 after reaching a total depth of 15,800 feet. The Cretaceous sands encountered during this drilling attempt showed good hydrocarbon reservoir potential.

The Amoco #1B.N. test was drilled about 1.5 miles northeast of the Ruby A Federal No. 1-9 Prospect in the NE1/4 NW1/4 of Sec 11 T9S R20E. The drilling attempt was plugged and abandoned in October 1976 after reaching a total depth of 14,848 feet. This site is the closest previous drilling attempt to the Ruby A Federal No. 1-9 Prospect.

The Impel 5-24 Ohara well is located less than four miles south of the Ruby A Federal No. 1-9 Prospect in the SE1/4 NW1/4 of Sec 24 T58N R103W, Park County, Wyoming. This 11,600 foot Madison Formation test was drilled in 1976 and recovered oil on a DST (drill stem test) of the Phosphoria Formation and production tested the Phosphoria at a rate of 200 barrels of oil and 800 barrels of water per day. This test is particularly important to the Ruby A Federal No. 1-9 Prospect since it is thought to be located on the southern extremity of the Ruby structure.

The Impel 1-23 Federal well located in the NE1/4 NE1/4 of Sec 23 T58N R103W was also drilled on the same structure as the Ruby A Federal No. 1-9 Prospect. Two test holes operated by Pacific Gas Transmission (NW1/4 NE1/4 Sec 32 T9S R20E and SW1/4 SW1/4 Sec 14 T58N R103W) were drilled on a shallower structure less relevant to the Ruby A Federal No. 1-9 Prospect. Both had Cretaceous and Upper Paleozoic oil and gas shows.

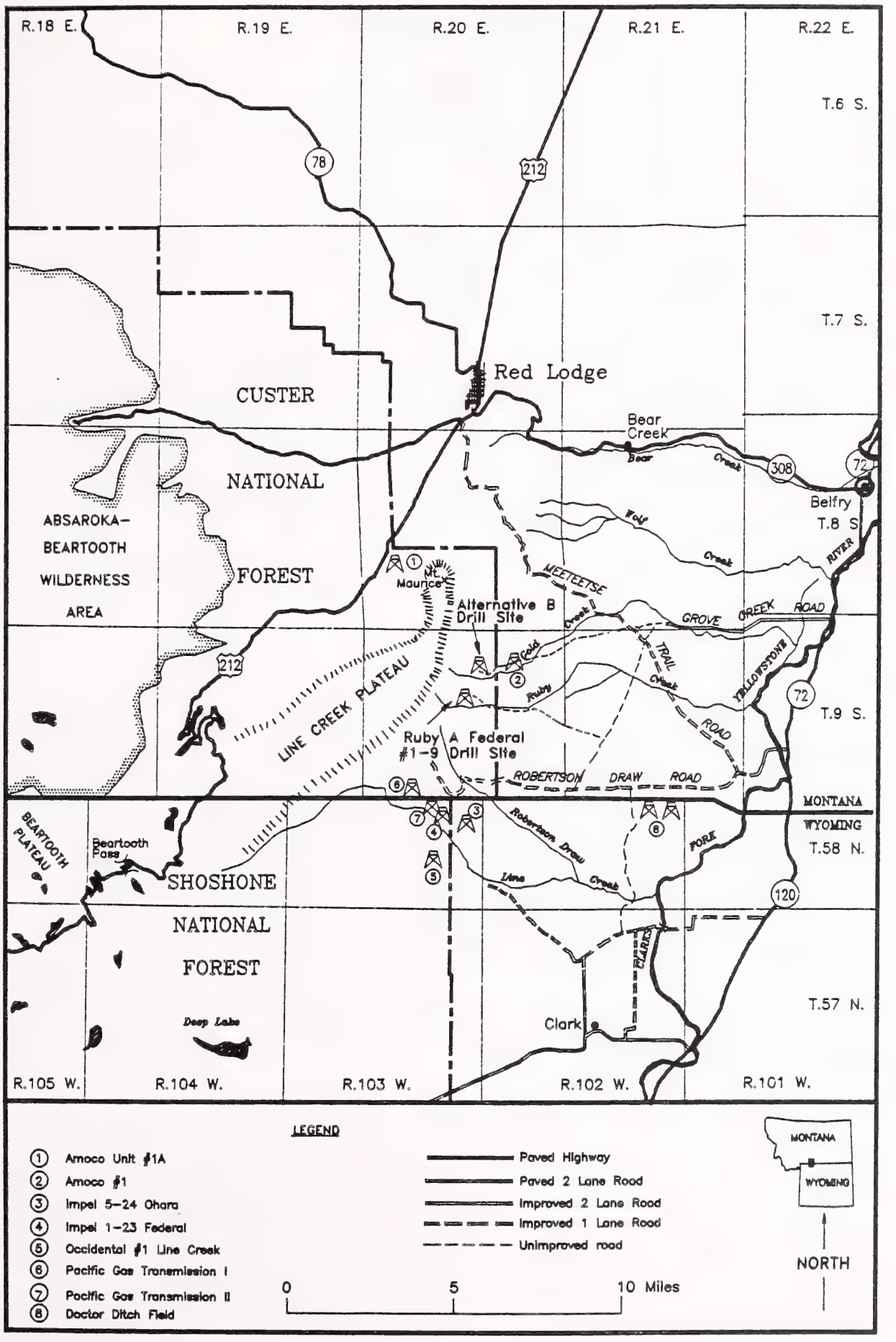

Exhibit B-1. Other Drilling Attempts in the Vicinity of the Ruby A Federal No. 1-9 Field Development

APPENDIX B

WELL DEVELOPMENT

Phillips proposes to drill the Ruby A Federal No. 1-9 Prospect to determine the presence of hydrocarbon reserves and evaluate the commercial potential of the reserves, if encountered, by conducting various tests. These tests would include analyzing drill cutting samples to detect evidence of oil, drill stem tests to determine more closely the performance of the hydrocarbon reservoir's productive capacity, and electrical log surveys to determine reservoir porosity and presence of oil and/or gas. Depending on the outcome of the testing program, Phillips may choose to permanently plug the well and abandon and reclaim the location, temporarily plug or shut-in the well until decisions are reached regarding future production options, or request approval to enter production operations.

As previously mentioned in Chapter 1 of this EIS, the decision to be made by Phillips regarding production from this one exploratory well is related to the amount/type of production encountered and the economic feasibility of producing that product from one well. This determination would be made after all well testing activities are completed and thoroughly analyzed by Phillips. If the decision is made to produce this well, there would be an interim period of no activity at the drill site when Phillips is attempting to obtain a permit to produce from this one exploratory well.

The following discussion describes activities associated with producing this one proposed exploratory well.

Oil Well Development

If the well is an oil producer, several steps would be taken to test, complete, or develop the well. These steps would occur on the well pad and normally include the following actions: installation and cementing of well casing; perforation of the reservoir; installation of production tubing; and installation of control heads (an assembly of valves and gauges called a "Christmas Tree") to regulate the rate of flow from flowing wells, or the installation of a pumping unit or other lifting mechanism to lift oil to the surface in a non-flowing well. Equipment off-site would include installation of a battery of tanks for storing the oil and installation of equipment to separate oil, gas, and water so that the oil meets sales requirements. Exhibit B-2 shows the types and amounts of production equipment normally found at an oil production facility. Segments of the drill pad not needed for production operations would be regraded, topsoiled, and revegetated as per the comprehensive reclamation plan *presented in Appendix D of the FEIS*. Cut and fill slopes associated with drill pad construction would be revegetated. The access road to the drill pad and production facilities would remain in place for maintenance and production development purposes.

Initially, if hydrocarbons were encountered, production from the well would be stored at the production facility in tanks as shown on Exhibit B-2 and trucked to market facilities. The number of trucks per day would be commensurate with the rate of production encountered. *Production operations would require use and maintenance of an access road from the production facility to Montana State Highway 72 on a year-long basis*. Maintenance during the summer and early fall months would be typical of graveled road maintenance in the area. Maintenance during the winter months would be relative to the amount of production encountered. Winter maintenance would include blading or plowing snow from the access road in a manner prescribed in a plan of

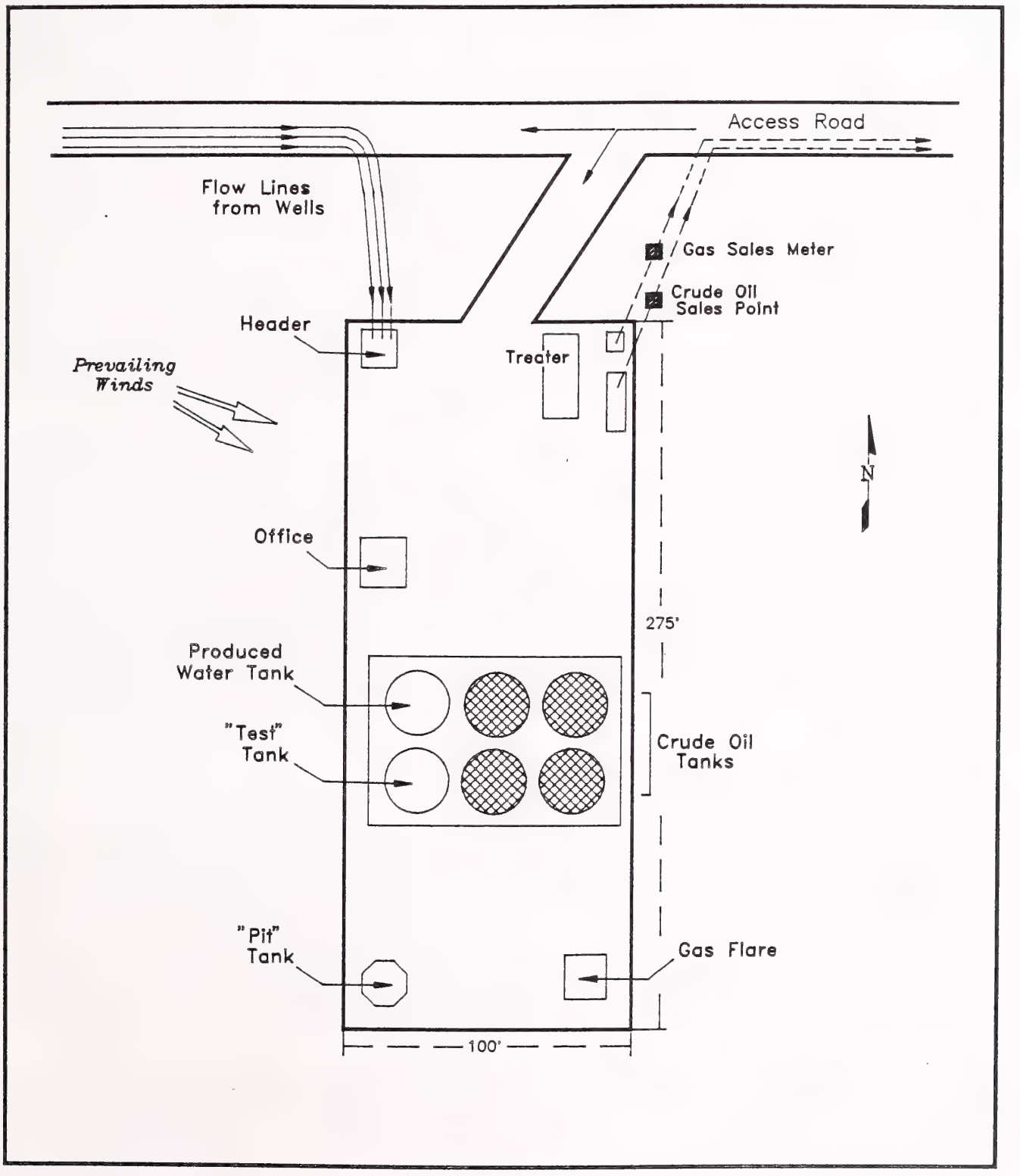

Exhibit B-2. Schematic of Production Facilities Site.

operations prepared by Phillips and approved by the FS/BLM. Exhibit B-3 shows the transportation system likely used by Phillips for hauling oil from one well.

Gas Well Development

Much of natural gas production is associated gas produced with oil. As a result, natural gas production is influenced by oil well development and production practices. There are, however, certain features of gas well development that are specific to gas production. Reservoir pressure is the controlling factor in the ability of a gas well to produce. Estimating the reserves and forecasting production rates and production life are early considerations in determining the economic feasibility of gas well completion and development. Completion of a gas well includes steps comparable to that of an oil well. Casing, tubing, and well head equipment are selected on the basis of flow rates, fluid erosion, and chemical corrosion. Safety shutoff equipment is more critical and must meet higher design standards. Compressors may be needed to help the gas enter the pipeline if the well producing pressure at the surface is less than pipeline pressure. In either case, safety and flow regulator valves are installed at the well head. The equipment and fittings must meet standards set by the American Petroleum Institute (API) following sizes and ratings established by the American National Standards Institute (ANSI) if corrosive conditions are expected.

Based on what Phillips knows of the geology of the area, their targeted formations described in the APD, and the negligible quantities of gas encountered during previous drilling attempts by other companies in the area, Phillips does not expect to encounter gas during the drilling of this exploratory well. If non-producible quantities of gas are encountered (i.e., not economical to produce), with producible quantities of oil, the gas would likely be flared or vented off as authorized by an approved venting or flaring permit issued by the BLM. Because known hydrogen sulfide (H_2S) bearing formations are to be encountered during the exploratory drilling attempt, Phillips has prepared a Contingency and Evacuation Plan (Appendix E). This plan prescribes techniques and precautions to be taken in the unlikely accidental release of H_2S during drilling operations.

FIELD DEVELOPMENT

Oil and/or gas field development generally requires more than one well to efficiently extract the hydrocarbon reservoirs. Well density and location are designed to efficiently extract the oil/gas reserves based on specific reservoir characteristics, economics, and environmental considerations. Most of the information required to determine appropriate well density and locations is not available until after the reservoir has been penetrated and production characteristics have been established during the exploratory phase. After considering all pertinent information, the well density would be subject to the approval of the State of Montana Oil and Gas Conservation Board and the BLM.

The following discussion regarding development of the Ruby A Federal No. 1-9 Prospect is based on what Phillips currently knows of the geology of the Ruby area from seismic interpretations and established well control data from fields to the northeast and southeast of the prospect area.

Only after exploratory drilling would more complete information regarding the geologic structures of interest be known. Once this geologic information is gained, more concrete determinations regarding the intensity and extent of field development would be made

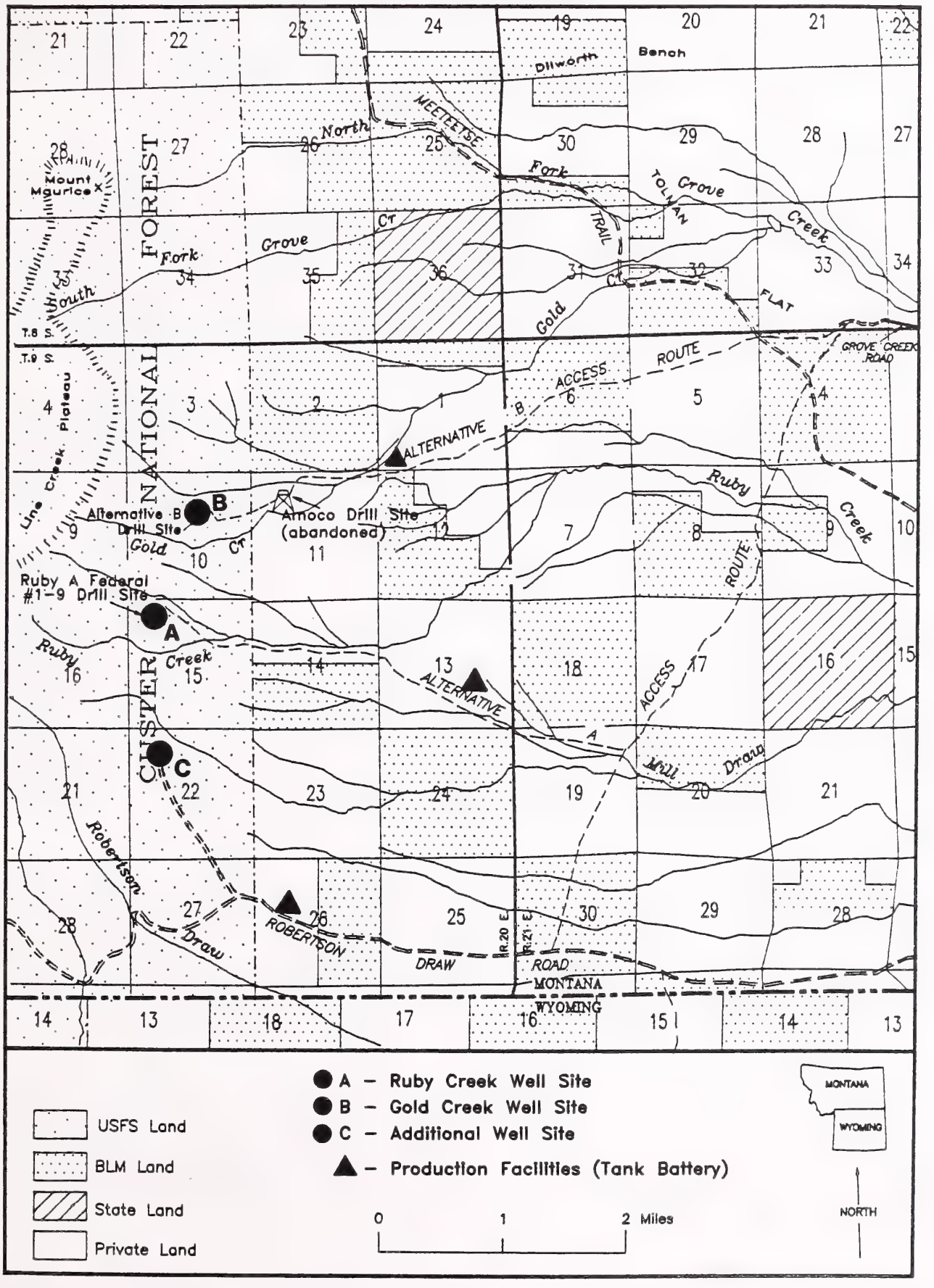

Exhibit B-4. Ruby A Federal Field Development Facilities.

the summer and fall months, wells could be visited more frequently. The use of automatic shutdown systems and well control from the remote production facilities would preclude the need for daily visits. Well sites would be accessed from the production facilities by enclosed motor vehicle during the winter months. Access roads to the production facilities from *Montana State Highway 72* would remain open year-round.

- The production facilities would require electrical power, continual access, and numerous pieces of production equipment as described above. Electricity would be brought in to the production facilities either from the north or south by tying into existing power sources. Powerline corridors from existing power sources to the production facilities would likely follow the transportation systems shown on Exhibit B-3. Power poles and line configurations would be designed to reduce impacts to raptors. Electricity would be located underground from the production facilities to the well pads.

  Phillips plans to install all flowlines, power oil/lift gas, instrument gas, electricity, and heating lines underground in the access road corridor, as needed, from the well sites to the production facilities to operate equipment at the well sites remotely. The number, size, and use of these lines would be determined by the characteristics of the hydrocarbon being produced. Characteristics and behavior of the hydrocarbon reservoir may make necessary changes from one production method to another over the life of the field.

- Pipeline/Transportation - Pipelines for fluids from the wells to the production facilities would be laid within the existing road right-of-way (ROW). Pipeline routes utilized from the production facilities to a tie-in with existing pipeline(s) would depend on the product destination (i.e., the purchaser of the product). There are several existing underground pipelines that could be utilized. These pipelines include three Husky lines (2-inch, 3.5-inch, and 4-inch), an Amoco 12-inch line, and a Marathon Oil 6-inch line. These lines are located approximately 12 to 15 miles to the east of the Ruby A Federal No. 1-9 field and generally parallel Wyoming Highway 120 and Montana Highway 72.

  Crude oil from the production facilities would be transported to market by pipeline if the volumes produced are large enough to justify the expense of laying the lines. If this justification cannot be made, crude oil would be hauled from the production facilities by tanker trucks and transported to a truck unloading depot where the crude oil would be unloaded into a pipeline leading to a larger interstate pipeline. Production amounts would be monitored by means of a Lease Automated Custody Transfer unit (LACT), or hand gauging.

  Pipeline construction would occur in a planned sequence of operations common to oil/gas pipeline installation specifications and would take place along a corridor of continuous activity. All pipeline installation work would be completed by a contractor working under Phillips supervision. An average 50-foot width of disturbance is anticipated. Pipeline construction activities are schematically shown on Exhibit B-5 and are summarized below.

  The actual pipeline location would be surveyed and staked prior to start of construction activities. The pipeline corridor would be cleared of heavy brush prior to earth-disturbing activities. Topsoil would be stripped starting from the center of the corridor, or center line of the trench, and windrowed along the

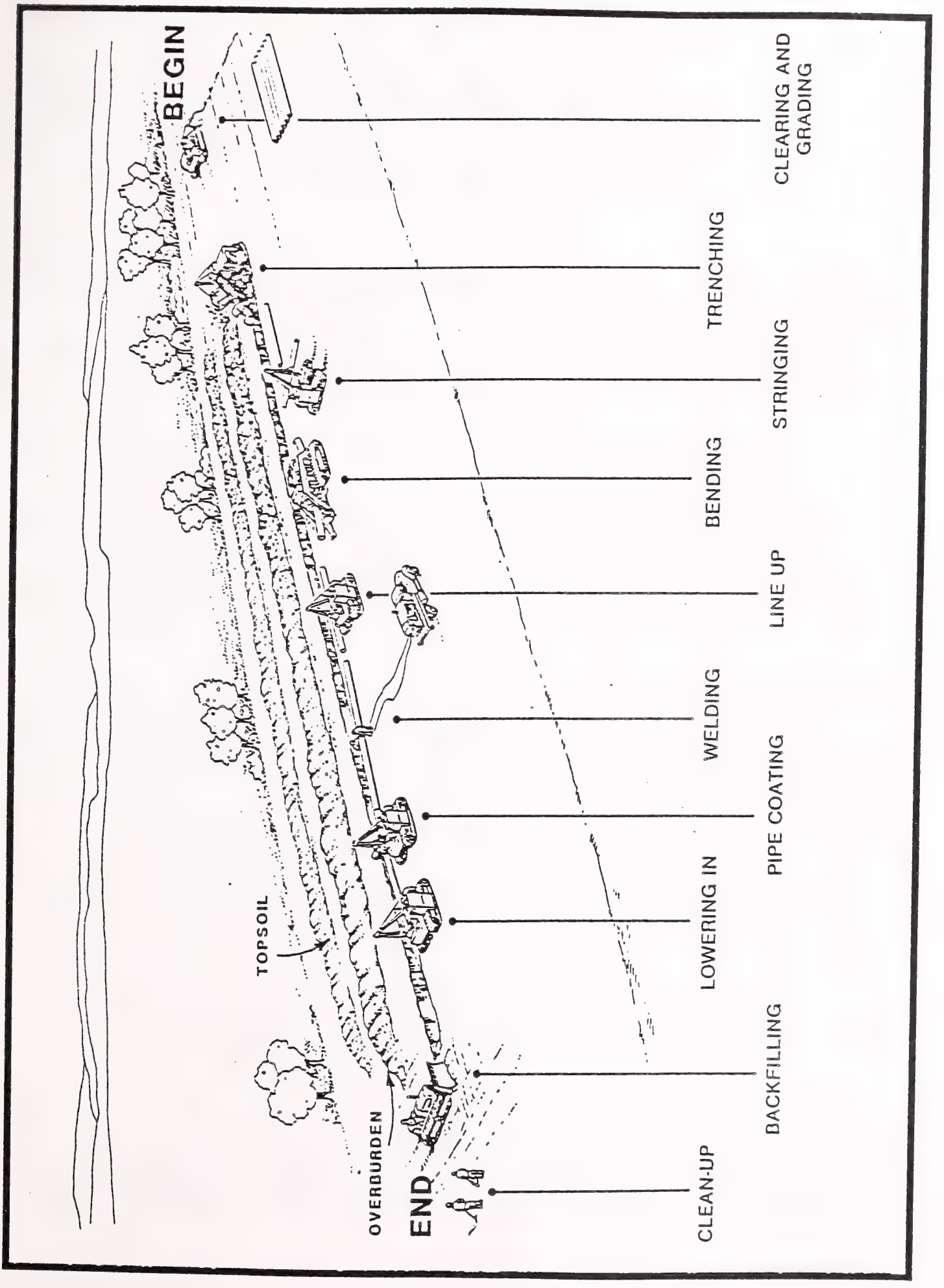

Exhibit B-5. Schematic of Pipeline Construction

outside edges of the ROW. The route would be graded as necessary for passage of construction equipment.

Subsoil would be removed and stockpiled separately from topsoil. The ditch would be excavated mechanically with ditching equipment. The width of the ditch would vary depending on the size of pipe being laid. For example, the ditch width would be 14 inches for a 4-inch-diameter pipe and 18 inches for a 6-inch-diameter pipe. The ditch would be of sufficient depth to permit a minimum cover of 36 inches over the pipe.

Pipe-laying activities would include pipe stringing, bending, welding, coating, lowering of pipeline sections, and backfilling. Special construction measures would be utilized where pipelines cross stream channels. Subsoil would be backfilled into the trench over the pipe. Site regrading would occur where necessary. Topsoil would be evenly spread over the disturbed area to a maximum depth of six inches, and reclamation of the pipeline route would occur as authorized by the BLM, FS, and the fee-surface owner.

Natural gas, if produced in sufficient quantities, would be transported by pipeline. The procedure utilized in transporting natural gas by pipeline is similar to that described for oil. As previously mentioned, based on what Phillips knows of the geology of the area, their targeted formations described in the APD, and the negligible quantities of gas encountered during previous drilling attempts by other companies in the area, Phillips does not expect to encounter gas during the drilling of this exploratory well. If non-producible quantities of gas are encountered with producible quantities of oil, the gas would be flared or vented as authorized by an approved venting or flaring permit issued by the BLM.

- Safety Systems - Because of the remoteness and sensitivity of the project area and operational timing constraints, safety shutdown systems would be included in the production facilities and well sites. Automatic shutdown systems would be used to assure that the wells cease operations when the flowline pressure is too high or low or if the well itself experiences an operations problem. The production facilities would also be operated with shutdown systems to control tank fillage. If for some reason tank space is limited, the wells would be shut-in by high level controllers in the tanks. Automatic shutdown systems using a variety of technologies are available. The system used could include electronic equipment requiring electricity at the well pad, spring and pressure activated systems that do not require electricity, or a combination of the two. The well heads would be equipped with surface safety valves. Flowlines would be equipped with high- and low-pressure shutdowns. The tank battery facilities would be equipped with high- and low-pressure shutdowns on the pumps and high-level shutdowns on tankage. Secondary containment for all tankage would also be provided by a berm around the batteries and/or facilities site.

ENVIRONMENTAL REVIEW

Discovery of commercial quantities of oil and/or gas reserves would likely lead to additional proposals for oil and/or gas development within the *Ruby Unit Area*. If the Ruby A Federal No. 1-9 Prospect is drilled and commercial quantities of oil and/or gas are found, BLM and FS regulations require that Phillips prepare a conceptual field

development plan and submit this plan for approval prior to further development. The field development plan would describe the extent, location, duration, and timing of additional wells and other facilities required for development of the field. The plan would be based on the findings of the Ruby A Federal No. 1-9 Prospect and would be restricted to specific activities or facilities needed to further explore or produce hydrocarbon products from the *Ruby Unit Area. Applicable lease and/or Unit Area stipulations would be integrated into the preparation of the field development plan. This would assure that the plan conforms with limitations provided in the lease/unit stipulations.*

Once Phillips submits a conceptual field development, the BLM and FS would complete an analysis of all aspects of the field development proposal and prepare the appropriate environmental document (either an EA or an EIS). As required by NEPA, the environmental review would include a formal process for identifying public and agency concerns regarding the development activities (including consultation with the U.S. Fish and Wildlife Service (USFWS)). The environmental analysis would specifically address the potential environmental impacts of the proposed field development activities and feasible alternatives. The analysis would be distributed for public, state, and federal agency review and comment. All comments received would be considered in the BLM and FS decision-making process.

Any proposed field development activities in Phillips' leasehold would also be subject to the permitting processes of the State of Montana. Depending on the nature and extent of the conceptual field development plan, field development activities may require additional or concurrent state environmental review under rules applicable in Montana. All federal and state requirements would be coordinated.

ANALYSIS OF IMPACTS

As noted in this EIS, sensitive resource values exist within the Phillips leasehold. The EIS determined that drilling of the Ruby A Federal No. 1-9 Prospect would cause short-term and long-term disturbance to, and displacement of, components of the human and natural environments. Subsequent development of an oil/gas field in the analysis area described in this EIS would likewise create both short-term and long-term disturbance and displacement of components of the human and natural environment. The following discussion provides an overview of the perceived impacts to the various resource components likely associated with field development as currently proposed by Phillips and provides mitigation measures that could be applied to avoid or reduce impacts to levels not considered significant.

Air Quality

As discussed in Chapter 4 of the EIS, air quality could be impacted as a result of construction and operation of the field in the following ways:

- Suspended particulate matter generated from the construction of roads, drill sites, and well drilling, tank battery sites, and pipelines;

- Accidental emissions of pollutants such as sulphur dioxide or hydrogen sulfide during exploratory well drilling, completion, or venting activities;

- o Emissions of pollutants resulting from permitted venting or flaring of produced gas;
- o Accidental spills of volatile petroleum products; or
- o Emissions from construction machinery.

Any increase in suspended particulate and equipment-generated pollutants would occur temporarily during construction and drilling. Dispersion rates of pollutants generated by the project, and air circulation patterns characteristic of the area, would sufficiently preclude development of concentrations in excess of the standards (ambient and prevention of significant deterioration) set by the State of Montana Air Quality Bureau Rules and Regulations. Similar conclusions were reached as a result of extensive air quality monitoring for the Riley Ridge field development project in southwestern Wyoming, a large field involving up to 220 wells (USDI-BLM 1983). Similar operations have shown that impacts associated with multiple well drilling activities, which include the actual well boring as well as construction of access roads and drill pads, are not greater than those of single well drilling activities (USDI-BLM 1983). This is because spatial separation of the drill sites allows sufficient dispersion and minimizes contributions from adjacent wells and because the wells are placed at varying elevations, thus producing a vertical separation plume that minimizes impacts from nearby drill sites.

Accidental emissions of sulfur dioxide or hydrogen sulfide during drilling or operation could occur. The potential of such an occurrence and a subsequent public safety hazard are considered low; however, Phillips would anticipate this possibility by implementing state-of-the-art prevention and safety measures described in the APD and in detail in the Contingency and Evacuation Plan presented in Appendix E of this EIS.

Other volatile petroleum products could be vented either accidentally or during normal operating procedures (BLM permitted venting/flaring). Based on currently available information on the targeted structure, Phillips expects to encounter negligible quantities of gas, and therefore, the amount of gas flaring would be expected to be small. Natural air circulation would effectively disperse emissions thereby minimizing concentrations below state and federal standards.

Diesel generators used in the drilling of wells and other heavy construction machinery would primarily emit NO_x, with secondary emissions of SO_2, CO, and TSP (total suspended particles). Air quality modeling of diesel generator and heavy construction emissions at the Riley Ridge field development project in southwestern Wyoming predicted that concentrations of NO_x, SO_2, and TSP would be below federal and state standards (USDI-BLM 1983). Monitoring during the recent operation of that field has validated the results of the modeling. Since the construction and operation of this field would be of significantly reduced magnitude compared to the Riley Ridge project, no significant impacts are anticipated to occur from this project.

The deposition of acidic species derived from SO_2, NO_x, and CO_2 emissions in pristine areas downwind would not likely occur. Extensive modeling and monitoring of the effect of these emissions from the Riley Ridge project have indicated that degradation and acidification of down wind Class I areas was not a problem. These areas included the Bridger and Fitzpatrick Wildernesses and Popo Agie Primitive Area. No significant impacts were predicted in the Riley Ridge study (USDI-BLM 1983) with respect to

increased acidity of Class I lakes. These predictions have been validated during recent monitoring. Since the Riley Ridge project is not significantly impacting the lakes in terms of acid deposition and since this field development project would not significantly impact air quality in the immediate project area, there would likely be no significant impacts to downwind areas.

In summary, adverse impacts to air quality in the project area could occur; however, the magnitude of these impacts would not be considered significant. Air quality would not be substantially impaired in the project area or region and the air quality of the Class I area of Yellowstone National Park would not be degraded. The implementation of this project is not expected to add significantly to impacts that have occurred or that may occur to air quality due to other on-going activities in the immediate area. The FS has indicated that there are concerns about cumulative air quality impacts from this project combined with existing and/or future projects in the Yellowstone River drainage. Air quality monitoring and modeling could be required to determine the potential cumulative impacts of all projects under concern. Such modeling would be a necessary component of a field development NEPA analysis.

Procedures and mitigation measures that could assist in reducing adverse impacts to air quality include road watering and other approved dust suppressants to prevent or minimize dust or suspended particulate problems and implementation of Phillips' Contingency and Evacuation Plan presented in Appendix E of the EIS.

Transportation

Transportation impacts resulting from field production would primarily involve potential change in traffic volumes, service levels of existing roads, and road safety. The cost of constructing the needed access roads would be commensurate with the costs presented in the Transportation Section of Chapter 4 of the EIS.

Two potential transportation systems that would serve field development have been identified and are shown in Exhibit B-3. Table B-1 summarizes the cumulative distance of each grade of road that would be utilized and the associated costs of each system. Total costs could range from $93,600 for implementation of the Northern System to a total of $104,200 and $574,200 for implementation of the Southern System without and with the cost of the new bridge, respectively. Table B-1 indicates that the Northern System would involve less total miles of roads at a reduced cost of construction compared to the Southern System. With the Northern System, all but approximately 2.0 miles of the Robertson Draw Road would involve expenditures on private roads as compared to the Southern System which would involve expenditures on all but 11.7 miles of existing public roads in the project area. However, the Southern Transportation System would require construction of a new bridge across the Clarks Fork at a total cost of approximately $470,000 as discussed in greater detail in Appendix C.

To access the additional drill site proposed in Section 22, approximately 1.9 miles of new road would need to be constructed at a total approximate cost of $27,500. This cost includes 1.0 mile of standard road construction at $5,000 per mile and 0.9 miles of box cut and end haul construction at $25,000 per mile. This estimate assumes the drill site would be located higher in the drainage to facilitate the horizontal displacement limitations of conventional directional drilling. If analysis of the exploratory well shows the drill site in Section 22 could be located lower in the drainage, Phillips would do so to reduce overall site disturbance and construction costs. Production facilities sites

would be located adjacent to the roads of the transportation system. Short access road spurs would be constructed to each site.

During project construction and drilling activities, an increase in traffic volumes would occur on Montana Highway 72 as well as secondary roads used to access the field. This increase in traffic would occur throughout the construction period which could last as long as 12 years depending on how long each of the six wells per drill site would take for construction and completion. The increase in traffic would not likely be significant nor would it downgrade the service level, driving comfort, or safety for people using Highway 72. However, the increased traffic over the potential 12 years could hamper other non- project-related traffic using the roads in the project area such as the Meeteetse Trail and Robertson Draw Road. Upon termination of construction activities, traffic levels would decrease to one to five vehicles per day associated with production activities.

Table B-1. Comparison of Cumulative Distance of Roads and Costs Associated with Construction of the Potential Transportation Systems.

	Northern System		Southern System	
Class of Road	(miles)	(cost $)	(miles)	(cost $)
Improved two-lane	5.0	0	1.5	0
Improved one-lane	2.0	4,000	12.7	25,400
Unimproved	15.3	45,900	11.7	35,100
New Road	3.1	43,700	3.1	43,700
Subtotal	**25.4**	**93,600**	**29.0**	**104,200**
New Bridge	0.0	0	0.0	470,000
TOTAL COST	**0.0**	**93,000**	**0.0**	**574,200**

During project construction, the placement of warning signs at strategic locations and the use of escort vehicles on all roads with legal public access would minimize impacts in regard to a decrease in service level or driver comfort or an increase in accident probability. Gate guards to restrict non-project traffic from the private portion of the roads would further minimize potential impacts.

FIELD DEVELOPMENT

Geology/Soils

Geology. Impacts that could occur within the project area fall into two general categories: 1) impacts to the geologic environment caused by project construction and operation, and 2) impacts to project facilities (including access roads) as a result of inherent geologic hazard or risk in the project area. Impacts to the geologic environment include alteration of existing topography, altering or otherwise damaging other mineral leases that may occur in the project area, initiation of landslides and mass failures, and alteration or destruction of paleontological remains. Impacts that could occur to the project primarily include inherent geologic risk or hazard such as damage to project facilities due to earthquakes, landslides, mass failures and movement of earth material.

Since the inherent geologic hazards in the project area do not pose significant danger or public safety hazard, impacts related to natural geologic hazards would not likely occur due to project construction and operation. Minimal topographic alteration would occur with project construction. These construction activities would not incite landslides, mudslides, debris flows, slumps, or avalanches. The potential for encountering paleontologic remains during project construction would be small due to the minimal excavation required to construct project facilities. If these remains are encountered, Phillips would notify the FS and BLM to determine the significance of the find and determine appropriate mitigation if required. The potential for damage of project facilities due to earthquakes would be minimal as discussed in Chapter 4 of the EIS.

Soils. Potential impacts that could occur as a result of implementation of the field development project include the removal of vegetation, exposure and disturbance of soil and mixing of soil horizons, the subsequent increase in the susceptibility of soil to wind and water erosion, and the subsequent loss of the soil resource. Increased surface runoff and erosion would occur primarily in the short-term and would decline in time due to natural stabilization and surface crusting as well as in response to properly applied drainage structures, sediment control structures, and mulching and seeding to promptly re-establish vegetation on disturbed areas. The exposure and disturbance of soil, combined with the loss of soil due to erosion, could reduce the quantity and productivity of topsoil for temporary and final reclamation.

Topsoil would be segregated for revegetation purposes to assure that the natural fertility and reclamation potential of the soil are not reduced. Indirect impacts to soils could occur from rutting and compaction from off-highway vehicles (OHV) as the result of increased vehicle access along the access road system.

The characteristics of the soils in the field area are presented in Table 3-2 of the EIS. With completion of the field development project, approximately 64.0 acres of soils would be disturbed with implementation of the Northern Transportation System and 55.0 acres with the Southern Transportation System. This area includes 8.5 acres for drill sites, 3.0 acres for tank batteries (i.e., one acre per battery site), 15.0 acres for new road construction (3.1 miles) under both transportation systems, and 37.0 and 20.0 acres for road reconstruction under the northern and southern transportation system, respectively. Pipelines from the well sites to the production facilities would be buried within access road rights-of-way; therefore, no additional soil disturbance would occur. Additional soil could be disturbed during construction of pipelines that would transport the product to existing pipelines. The location and total distance of these pipelines are not known at this time.

Most of the soils have relatively high permeabilities, low runoff potential, and low to moderate erosion potential such that significant erosion is not expected. Successful reclamation of cut and fill slopes should be attainable although the relatively poor reclamation potential due to the low fertility and high coarse fragment content of the soils would require aggressive reclamation techniques to maintain soil productivity. Further, the high coarse fragment content could hamper selective topsoil salvage and handling. The large boulders along portions of the access routes, drill sites, and tank battery sites would require special handling during construction as well as during reclamation to minimize the loss of topsoil. Special handling would entail separating the large boulders from the topsoil. Cut and fill slopes of all access roads and facilities sites would be mulched and revegetated to minimize soil erosion and reduction in soil productivity.

Assuming best management practices, including an aggressive revegetation and erosion control program (FS handbook 2509.22, Appendix D of the EIS, and the Surface Operating Standards for Oil and Gas Exploration and Development: USDI-BLM and USDA-FS 1988), erosion would be reduced by more than 75 percent after the first year of construction and by more than 95 percent after five years, as discussed in Chapter 4 of the EIS. Thus, soil erosion is not expected to be a problem with field development.

Existing land management activities that have impacted the soil environment to varying degrees within the project area primarily include grazing on non-Forest lands and road construction and use. In some areas grazing has been excessive, resulting in soil compaction, vegetal cover removal, and subsequent increase in soil erosion. Road construction and use has caused an increase in soil erosion since a large portion of cut and fill slopes has not been protected from erosion with revegetation. Further, since most of the roads in the project area are unimproved, drainage and runoff control are sub-optimal. This adds to the increase in soil erosion over natural base rates. Overall, these impacts are not cumulatively significant, and implementation of the proposed project would not significantly add to these impacts. Prompt revegetation of cut and fill slopes as well as the placement of optimal runoff and erosion control structures would likely reduce erosion levels from the road improvement; therefore, no significant cumulative impacts are likely to occur due to implementation of the proposed project.

The measures presented in the site-specific reclamation plan presented in Appendix D of the EIS, combined with measures presented in FS Handbook 2509.22 and in USDI-BLM and USDA-FS (1988), would greatly reduce adverse impacts to soils, including erosion losses. Interceptor ditches encompassing drill pads and battery sites that drain/flow into/through sediment traps would control erosion and prevent off-site sedimentation. All topsoil should be stripped from areas to be disturbed, stored, and reapplied to ensure a productive growth medium for plants. Stored topsoil should be secured from erosion loss by mulching and/or temporary revegetation. Successful and timely revegetation of disturbed areas, including implementation of a fertilization program, would greatly reduce impacts to soils. Special handling of the large boulders that would be encountered along or at field facilities would promote successful reclamation. Application of these measures would greatly reduce the probability of significant impact to soil resources due to field development.

Water Resources

Water resources in the field area are the same as described in the Water Resources Section of Chapter 3 of the EIS. Mill Draw has similar flow characteristics as described

for Ruby and Gold creeks; however, the stream tends to be more intermittent along its length within the project area than Ruby or Gold creeks. The information on water rights and claims presented in Chapter 3 of the EIS also applies to the field development area.

Impacts associated with the construction of drill pads, tank batteries, and access roads include the removal of vegetation, exposure of the soil surface, and compaction of the soil with resultant increases in overland flow and subsequent erosion and off-site sedimentation. If these changes occurred in close proximity to a stream, they could create the potential for increased streamflow, increased stream sedimentation, and subsequent degradation of water quality below standards. The magnitude and duration of these impacts depend on several factors, including slope aspect and slope gradient, degree and area of soil disturbance, susceptibility of soil to erosion, and proximity to established drainage channels. The duration of time within which construction activities take place and the timely implementation of and success or failure of mitigation measures applied would also be factors. These potential impacts would be greatest soon after the commencement of construction activities but would decrease shortly after due to passive natural stabilization. Phillips proposes to implement best management practices as presented in Chapter 5 of the EIS, the site-specific erosion control, revegetation, and rehabilitation plan (Appendix D), Soil and Water Conservation Handbook (FS Handbook 2509.22), and Surface Operating Standards for Oil and Gas Exploration and Development (USDI-BLM and USDA-FS 1988) to minimize erosion and off-site sedimentation.

Minor stream channel disruption could occur where access road construction or reconstruction crosses streams such as at Gold and Ruby creeks and Mill Draw. Channel disruption could include alteration of channel configuration, gradient, or bed texture and subsequent changes in aggradation/degradation regime. All channel crossings would be designed and constructed to handle 50- to 100-year storm events and to minimize stream environment disruption.

Water would be used during road, drill pad, and tank battery construction as well as during well drilling and would be obtained and trucked from surface water and groundwater sources in the project area. It is possible that approximately 23 acre-feet (1.3 acre-feet per well) of water would be required for drilling alone. This demand would occur over the duration of the drilling period rather than at one point in time. Additional water would be required during construction of access roads, drill sites, and facilities sites; however, the quantity of water needed would be substantially less than the quantity needed for drilling. The quantity of water needed for construction purposes would be specified in a construction and use plan for the field development project. The quantity and rate of water withdrawal would be minimized and appropriate state permits would be obtained. The quantities of water used would be minimized so that impact to water resources would be minimal (i.e., no reduction in the watertable and/or in instream flows).

Impacts that would occur due to construction of access roads, drill sites and tank batteries would be minor. A slight increase in erosion and off-site sedimentation would occur; however, the quantities would be small in the short-term and non-existent in the long term. Exposed soil would be quickly stabilized and protected, and efficient runoff and drainage control structures (FS Handbook 2509.22 and Appendix D of the EIS) would be constructed at disturbed areas to minimize impacts to levels not considered significant. All drainage crossings would be designed and constructed to facilitate 50- to

100-year channel flows following standard engineering procedures. Most of the existing channel crossings would be upgraded to a more environmentally sound design. Erosion and sedimentation would occur below current levels through implementation of efficient runoff and erosion control structures.

Groundwater contamination could occur from well construction or operation due to the leakage of drilling fluids into groundwater or to the mixing of groundwater of differing quality from different aquifers. Groundwater, oil, and gas may occur under high pressure; upon being penetrated during well drilling, they could migrate laterally along geologic strata or vertically along the outside of the well casing to areas of lower pressure. Contamination could reach surface water in areas at or below seeps, springs, or significant groundwater outflow. To prevent these potential impacts from occurring, the well would be fully cased with pressure-tested pipe and cemented as itemized in Phillips' APD. The annulus, or void space between the outside of the casing and the drill hole, would be filled and sealed with cement as stated in Phillips' APD.

Phillips proposes to use a closed mud system for well drilling. This system requires a substantially reduced storage capacity for drilling wastes and cuttings. The cuttings trench would be constructed in full cut on each drill site. This measure would provide adequate structural strength, thereby minimizing the potential of trench failure and subsequent spillage. Leakage of liquids would be possible; however, a properly installed synthetic liner would preclude leakage and subsequent contamination of groundwater or live streams in the development area. Trench overflow could potentially occur during or following drilling. Heavy rains or snowmelt could fill and overflow the trench. Over-design of the trench, or utilizing a maximum of 75 percent of its capacity for drilling wastes and the balance for direct precipitation and runoff, would preclude overflow.

Spillage of petrochemicals associated with construction or operation of the project could also impact both surface and groundwater if released in close proximity to streams. Facilities sites would be located far enough away from streams and drainage channels that a spill would not likely reach these hydrologic features. Except where roads cross streams, no facilities would be constructed within the 100-year floodplain of a stream. Further, a series of berms and/or interceptor trenches would be constructed around all facilities sites (i.e., drill sites, well sites, and tank batteries) to contain any petroleum product spill that might occur. The design and implementation of a chemical Spill Prevention, Control, and Countermeasures Plan (SPCC Plan) pursuant to Section 11.07 of the FS Handbook 2509.22 would greatly reduce impacts that could occur in the event of a spill.

Although pipelines would be placed within road rights-of-way where possible, thereby minimizing impacts, pipeline crossings of drainage channels could disrupt stream flows due to adverse changes in channel geometries and channel bed materials. Pipelines would be buried to a depth of at least four feet below the maximum scour depth associated with a 100-year flood event, and channel beds would be restored to predisturbance conditions in terms of geometry and bed material. Pipelines would be hydrostatically tested to establish competency. Water for use in hydrostatic testing would be obtained from state-permitted points of withdrawals (i.e., surface and groundwater). Once the testing was completed, the test water would be discharged into holding ponds to minimize the potential for soil scouring and either evaporated or used in the construction of facilities sites. The oil and gas industry has established that with specially treated pipe interiors, no adverse contamination of the test water would occur that could result in environmental degradation.

Oil and/or gas would need to be transported to existing underground pipelines or trucked to major transportation routes such as Montana Highway 72. Regardless of the mode of transport, the product would need to be transported across the Clarks Fork to reach the existing pipelines or Highway 72. Special construction design would need to be exercised for the pipeline crossing of the Clarks Fork. Similarly, precautions would need to be exercised in transporting oil across the Clarks Fork by truck. Phillips would design the product transportation plan and submit the plan for agency review and approval prior to project construction.

Although adverse impacts to water resources could occur due to drill site construction, operation, and reclamation, these impacts would not be considered significant relative to degradation of surface and groundwater, modification of surface water flow or groundwater levels, construction within a 100-year floodplain, downstream water control structures or water rights, or slope stability problems due to interception of shallow groundwater. As established in the Water Resources sections of Chapter 3 and 4 in the EIS, field development would not likely affect fishery resources in the project area, including the Clarks Fork due to the few perennial to intermittent streams in the field area and the large distance to the river.

Existing land and resource management activities within the project area primarily include grazing on non-Forest lands and road construction and use. These activities and uses have not substantially affected the water resources in the project area. Road construction and use has caused an increase in soil erosion since a portion of cut and fill slopes have not been revegetated. Further, since most of the roads in the project area are unimproved, drainage and runoff control are sub-optimal. This adds to the increase in soil erosion over natural base rates. Overall, these impacts are not cumulatively significant. Implementation of the field development project would likely decrease erosion and sedimentation from roads since drainage and runoff control would be improved; therefore implementation of the proposed project would not significantly add to these impacts. Further, the demand for approximately 7.6 million gallons of water over the drilling period (i.e., 6 to 18 years) would be small compared to the total amount of water available in the area. Therefore, meeting the demand for water used during construction and drilling would not cause substantial or significant cumulative impacts on water quantity in the project area.

With implementation of the mitigation measures summarized above; the specific mitigation items presented in Chapter 5 of the EIS; FS Handbook 2509.22; the Surface Operating Standards for Oil and Gas Exploration and Development; and the site-specific erosion control, revegetation, and rehabilitation plan presented in Appendix D of the EIS, no unavoidable adverse impacts would occur to water resources.

Vegetation, Timber, and Range Resources

Vegetation resources within the field area are essentially the same as described for the project area in the Vegetation, Timber, and Range Resources Section of Chapter 3 in the EIS. Exhibits 3-3 and 3-4 of the EIS show the distribution of the general vegetation cover types within the field area.

Clearing vegetation and disturbing soils during construction of the access road and drill site would directly impact general vegetation and related resources. Project implementation with the Northern Transportation System (Exhibit B-3) would involve approximately 45.5 acres of sagebrush scrub, 14.1 acres of limber pine woodland, 4.3

acres of mixed conifer, and approximately 0.1 acres of riparian. Project implementation with the Southern Transportation System (Exhibit B-3) would involve approximately 39.1 acres of sagebrush scrub, 12.1 acres of limber pine woodland, 3.7 acres of mixed conifer, and approximately 0.1 acres of riparian. No alpine bunchgrass and forbland or agricultural land cover types would be impacted. Except for riparian cottonwood and willow scrub, a reduction in the areal cover of vegetation community types affected would be a negligible impact since these communities are common, have wide distribution, and occur with high frequency within the general project area. Disturbances to wetlands (i.e., riparian) could require administrative coordination with the Department of Army Corps of Engineers (COE) pursuant to the federal Clean Water Act. Section 404 permit(s) could be required. The COE, based on the exact nature of the disturbance activity and site-specific conditions, would determine the type of permit (Individual, Regional, or Nation-wide) required according to the rules and regulations presented in the Federal Register (1986).

The duration of these impacts depends on the time required for natural succession to return revegetated areas to predisturbance conditions. Vegetation cover types within the project area primarily have poor to fair revegetation potentials, with some small isolated areas having a good potential as itemized in the Soils Section of Chapter 3 of the EIS. Vegetation could stabilize most disturbances within one or two years with implementation of the measures presented in the reclamation plan included in Appendix D of the EIS. More difficult sites to reclaim could take longer (i.e., 3 to 5 years).

Construction activities could introduce undesirable and noxious weed species into an otherwise weed-free area. These weeds often out-compete the more desirable species, rendering the site less productive as a source of forage for livestock and wildlife. Sites dominated by weeds often take on a different visual character that may visually contrast with surrounding undisturbed vegetation. Monitoring for noxious weed invasion in the field area and immediate control would preclude the occurrence of this significant impact. The FS and BLM would be responsible for ensuring that monitoring for noxious weeds occurs and, if necessary, eradication measures are designed and implemented. The FS/BLM would hold a reclamation bond from Phillips until they determine that invasion of noxious weeds is not evident or that eradication and reclamation measures have been fully successful.

Construction and operation of the proposed project would not directly or indirectly affect the quality or integrity of the proposed Meeteetse Spires Preserve since no project facilities are planned for the area. *A survey for the plant species of concern listed in Table 3-4 of the EIS was completed in July, 1989, along all project components considered in the EIS. Only bird's foot sagebrush was found along project components in the eastern portion of the project area. Therefore, this species could be impacted by development. Any facilities beyond those considered in the EIS could be impacted by production development and operation.* Only the species that inhabit sagebrush scrub, limber pine woodland, and/or mixed conifer could be potentially impacted by field development. Prior to project construction, all *additional* facilities sites would be surveyed for these species and appropriate mitigation implemented if the species were found on the sites. Mitigation would be coordinated with the Montana Natural Heritage Program (MTNHP).

Construction of this project could result in a reduction in livestock and wildlife forage and a subsequent reduction of animal unit months (AUMs) in the Grove Creek Allotment. See the Vegetation Section of Chapter 3 in the EIS for a description of the

Grove Creek Allotment. For the purposes of assessing impacts to range resources, acres of disturbance associated with construction were based on a conservative average of five acres per AUM. USDI-BLM (1983) indicates an average of five acres per AUM on the allotment. Implementation of the field development project would involve the loss of approximately 11 to 13 AUMs depending on the transportation system, which is less than five percent of all the AUMs within this allotment. Thus, significant impacts to grazing are not expected due to field development. Similarly, implementation of field development would not likely affect critical ranching operations. Reimbursement of ranchers for accidental death of livestock in the Grove Creek Allotment due to project-related vehicle collision would be a condition of the access road ROW permit or per agreement with private land owners.

Existing land management activities that have impacted the vegetation in the field development area to varying degrees primarily include grazing, road construction and use, and other oil and gas exploration and development such as at the Doctor Ditch Field. In some areas grazing has been excessive, resulting in soil compaction, vegetal cover removal, and subsequent increase in soil erosion. Overall, these impacts are not cumulatively significant, and implementation of the field development project would not significantly add to these impacts.

Adverse impacts to vegetation and associated resources could be greatly reduced or avoided by revegetating all disturbed areas as soon as possible after project construction through implementation of the measures contained in the site-specific revegetation, rehabilitation and erosion control plan presented in Appendix D of the EIS. Road construction should avoid wetland areas. If avoidance is not possible, the area of disturbance should be minimized. Only certified weed-free mulch should be used for erosion control and revegetation purposes. A monitoring program should be designed and implemented to detect noxious weed invasion. If an invasion is detected, eradication measures as described in USDA-FS (1986) should be implemented immediately. Prior to facilities site construction, all areas to be disturbed should be staked and surveyed for plant species of concern. The survey should be conducted during the growing and/or flowering seasons. If any of the species itemized in Table 3-4 were found, the feasibility of re-routing or relocating areas that would be disturbed should be determined. All range improvement structures such as fences, cattleguards, and water developments should be left in functional condition to maintain current allotment management operations. With the implementation of these measures, no unavoidable adverse impacts would occur due to project development.

Wildlife

The proposed and alternative drill sites, and the access alternatives leading to these sites, pass through habitats of several species listed in the Management Plan for the Custer National Forest, Management Area C, as major-interest wildlife species. These habitats include elk spring, fall/rutting, and winter range, calving habitat, and migration corridors; year-round habitats of mule deer, pronghorn antelope, and white-tailed deer. The habitats of four species listed as management indicator species for the Custer National Forest (USDA-FS *1987*) occur on or adjacent to the drill sites and access routes. These species include Brewer's sparrow, northern oriole, yellow warbler, and goshawk. Habitats of several other important wildlife species occur adjacent or proximal to the proposed project area. These habitats include white-tailed prairie dog colonies, year-round sage grouse habitat, spring and fall black bear habitat, and nesting and foraging habitats for prairie falcons.

No federally listed threatened or endangered wildlife species, or candidate species, are known to inhabit or frequent any of the drill sites, facilities sites, or access routes; however, several such species are known to occur occasionally or periodically in the area (bald eagles and peregrine falcon). No classified grizzly bear habitat occurs on or in the near vicinity of the project area, and there are no records of grizzly bear sightings either along the eastern front of the Line Creek Plateau or on the big game winter range along the Montana/Wyoming state line (Roop 1988 and Stewart 1988). There are no confirmed black-footed ferret sightings in or near the project area, and only marginal habitats for this species exist in the entire region (Stewart 1988 and Flath 1988).

More detailed descriptions and listings of wildlife species in the area of the potential field development are set forth in Section 3.6 of the EIS.

Potential impacts to elk and other wildlife that could occur with implementation of the Ruby or Gold Creek Alternatives have previously been described in Chapter 4 of the EIS. The third potential drill site associated with the Phillips field development proposal is located in the NW1/4 Sec 22 of T9S R20E in Mill Draw, about one mile south of the Ruby Creek drill site (Exhibit B-6). This drill site would have essentially the same habitats for wildlife as described for the Ruby Creek site (Alternative A in the EIS). One notable exception is the fact that the Mill Draw site is well within the boundaries of the core winter range for elk while the Ruby site is on the northern edge and the Gold Creek site is outside and north of the winter range boundary (Exhibit B-6). The detailed description of potential impacts presented in Chapter 4 of the EIS, and the mitigation and avoidance measures set forth in Chapter 5 of the EIS apply equally to the Mill Draw site.

The simultaneous development, operation and production of the three drill sites, however, would increase the likelihood of increasing the magnitude of several potential impacts beyond those expected from the drilling and operation of a single well, and would also create several new ones. New impacts include: (1) an extension of total area exposed to potential impacts because of activities that are dispersed across multiple sites, (2) an extension of the total time period over which potential impacts may occur (e.g. all year for multiple-year time periods vs June 15-November 15 over a two-year time period), (3) an increase in the number and kind of human activities to which wildlife species will be exposed, (4) potential negative effects associated with the translocation of petroleum products off the well sites and out of the area, and (5) the potential for accidental spill or discharge of petroleum or other chemical products. There would be greater potential for impacting elk on spring, winter, and fall/rutting ranges because: (1) more total acreage of these habitats will be subjected to project activities, and (2) periodic required human activities would continue on the well sites throughout the year. The mitigation and avoidance measures set forth in Chapter 5 (5.3.6) of the EIS, combined with those set forth in this section, would reduce these potential impacts to levels considered non-significant.

Potential occupancy of crucial habitat for more than two years resulting from field development activities could significantly impact elk according to Impact Significance Criteria No.1 set forth in Section 4.6.2 of the EIS. The full potential for impacts to elk will not be known though until the details of the actual field development proposal are set forth. It is therefore recommended that the elk study currently being conducted by Dr. Fred Van Dyke be continued at least throughout the exploratory drilling phase of the project. When or if field development is undertaken, the study should be continued to

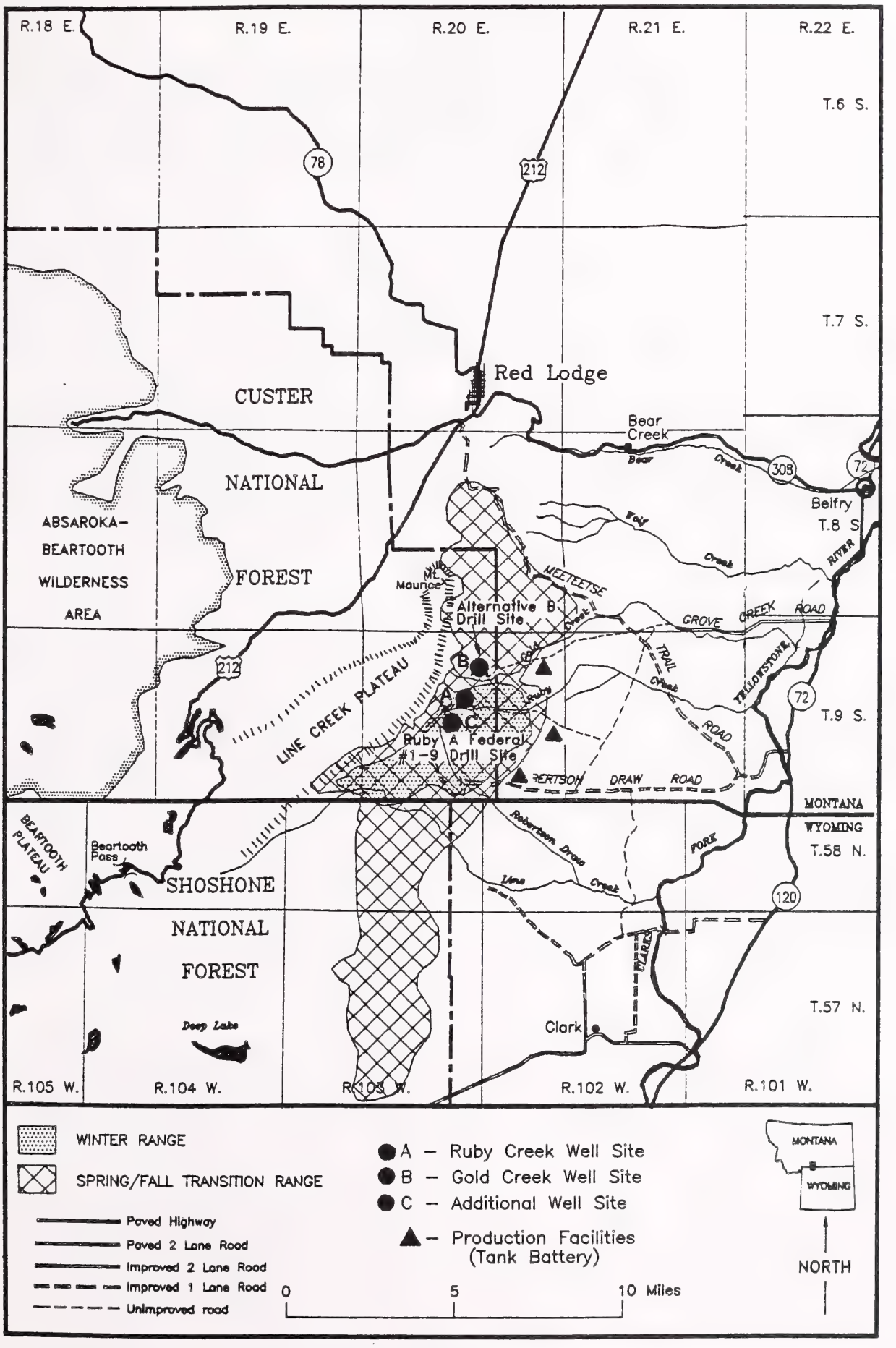

Exhibit B-6. Sensitive Elk Habitats in the Vicinity of the Ruby A Federal Field Development Area.

monitor effects of elk in order to: (1) maintain an on-going assessment of the effectiveness of prescribed mitigation measures, (2) obtain a specific measure of elk response to the proposed actions, and (3) develop a solid data base for use in possible future environmental analyses of field development. In addition, when or if field development is actually proposed, completion of additional environmental analysis and biological evaluation for a specific field development proposal would be required to fulfill NEPA requirements.

As previously mentioned in Section 4.6.6 of the EIS, elk may develop long-term avoidance responses to repeated impacts or disturbances within their habitats when these disruptions are continued over extended periods of time. Since the period and complexity of continuous operations in field development projects can be expected to greatly exceed those of an exploratory well, the potential for the development of avoidance responses in elk is also greater. The possibility exists that elk conditioned to avoid certain key segments of their habitats will concentrate on and overuse other portions of their normal habitat, or join other herd units and seek alternative habitats in some other area (Van Dyke 1989). Elk displaced from their normal winter and early spring habitats or diverted from their traditional migration corridors by well operations are likely to suffer the consequences described in Section 4.6.3.2 of the EIS and move into adjacent croplands in Wyoming, causing an increase in the existing crop-depredation problem there.

Impacts associated with the drilling of a single well that would likely be increased by a field development operation include: (1) traffic levels that would proportionately increase the potential for vehicle/wildlife collisions over the entire access route, (2) potential for displacement of black bears from spring/fall ranges, (3) physical loss of wildlife habitats from road, drill site, production site, and pipeline construction, (4) displacement and mortality of raptors from powerline and drill site construction and operation, and (5) displacement, injury or mortality of federally listed and candidate species.

Petroleum products would be sold at the production facilities and the potential impacts created by the transportation of such products from these facilities would be the responsibility of the buyer. *The impact of transportation of petroleum products during production would be specifically analyzed in additional NEPA documentation (EA or EIS) if production was determined to be economically feasible after the exploratory phase.*

The nature and magnitude of potential impacts generated by product translocation will vary according to whether trucking or pipelines are used as the mode of movement, and the route selected. If pipelines are used to move the products and are buried in access rights-of-way, very little impact to wildlife species is likely. Cross-country pipelines would, through excavation and stripping of vegetation, eliminate a moderate quantity of some wildlife habitats in the short-term and modify, through the process of plant succession, other habitats in the long-term. Wildlife species whose habitats could be impacted by a cross-country pipeline include mule deer, white-tailed deer, Hungarian and chukar partridge, sage grouse, white-tailed prairie dog, pronghorn antelope, white-tailed jackrabbit, cottontail rabbit, and possibly mountain plover and long-billed curlew. Species potentially impacted would depend on the route selected. Habitats affected would consist of sagebrush scrub and various agricultural lands.

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Trucking of products would present the greatest potential impact to wildlife species by increasing the chances for collisions with vehicles. Species that could be impacted include those listed previously under the cross-country pipeline discussion plus bald and golden eagles, which may feed on road-killed carrion and thereby subject themselves to the same fate.

In addition to the completion of a new environmental analysis pursuant to NEPA and the Biological Evaluation for a specific field development proposal, the following steps should be taken to mitigate or reduce to acceptable levels the impacts expected from a field development program:

- All storage and production facilities should be located outside of designated elk habitats.

- *Noise levels at the well site should be maintained within limits which elk will adapt to and which will not increase their displacement distance beyond that already created by visual impacts (the viewshed). In order to contain the displacement of elk within these limits, noise levels within 300 feet of the drill site should not exceed 65 decibels (dB).*

- Wells should be operated remotely from off-site production facilities to minimize the amount of human activity on the well sites during critical time periods for elk.

- During the winter and spring months (November 15-June 15) limit the visits to each site to the lowest possible frequency (one per week if possible) in order to minimize the potential for displacing elk. Visits should be restricted to the mid-day period (10am to 3pm) when the elk are the least active, and likely to be bedded upslope in the timber and out of the immediate drill site vicinity (Stewart 1989). Inoperative wells which cannot be repaired during the course of regular weekly visits should be shut down until elk have left the range. Visits should be made via an enclosed motor vehicle rather than on foot since elk are more tolerant of humans in vehicles than they are to humans on foot (Ward and Cupal, 1979).

- The potential for vehicle/wildlife collisions can be reduced substantially by requiring all drivers to take a training session describing the type of wildlife in the area that are susceptible to vehicular collisions, the circumstances under which such collisions are likely to occur, and the measures that can be employed to minimize them. The probability of animal/vehicle collisions can be further reduced by imposing speed limits on access roads and prohibiting night travel. If night travel cannot be eliminated, speed limits should be further reduced during the hours of darkness.

- *On areas previously unsurveyed, a* breeding season survey for mountain plover and long-billed curlew should be conducted prior to commencement of road improvements and operational traffic. The survey should cover the eastern reaches of road that traverse major topographic benches adjacent to the Clarks Fork of the Yellowstone River. Such a survey would determine whether or not these species are present along the access road and, if present, what the potential for impact is. If an impact potential is found to exist, mitigation measures appropriate to the circumstance and which would safeguard the

species would be implemented in consultation with the USFWS (e.g. imposition of time-frame restrictions on road construction and operational road traffic to protect young birds on the road, reduced speed limits in high risk areas, etc.).

- Delay the commencement of drilling in the late spring until June 15 to ensure that elk calves are old enough to travel safely with their cows and to guard against any displacement of elk from the spring range into hayfields in Wyoming.

- In order to minimize the probability of displacing elk from their seasonal transition, fall/rutting, winter, and calving habitats, project operations within designated elk habitats should be limited to the period extending between June 15 and November 15 during years of normal climatological events. During years of abnormal climatological events (drought, unseasonably early and heavy snow, extensive fire, etc.) drilling operations should be terminated on a designated date between September 15 and November 15, when or if FS officials, in consultation with Montana Department of Fish, Wildlife and Parks (MDFWP) biologists, determine that the continuation of operations beyond that date would have a significant negative impact on elk, according to the impact significance criteria defined in Section 4.6.2 of the EIS.

- *To insure the maintenance of some disturbance-free areas for elk during the fall period, do not conduct drilling, construction, or work-over operations on more than one site after September 15.*

- In the event that drilling cannot be completed in a single operational period (June 15-November 15), the drill rigs should be dismantled and removed from the elk range until June 15 the following spring. To avoid the possibility of elk developing a permanent or long-term avoidance behavior towards the drill site, and to encourage rotational use of the entire elk habitat, drilling activities should not continue through November 15 on any single drill site for more than two consecutive years.

- Road maintenance and construction work outside of designated elk habitats can be performed at any time without impacting elk.

- In order to facilitate big game movements and minimize the potential for injuries, road access ROWs should not be fenced.

- Because black bears are common in the area, steps should be taken to minimize the possibility of attracting them and to avoid possible human/bear encounters. All personnel should be informed and educated regarding actions and circumstances that are likely to result in human/bear encounters and the measures that could be taken to minimize the potential for such encounters. The prescribed Interagency Grizzly Bear Guidelines for food handling and storage and the disposal of garbage should be followed so as to minimize the possibility of attracting bears. No dogs or firearms should be allowed on the drill site or project. Any bear problems should be reported promptly to biologists of the MDFWP. The same climatological and time constraints, described previously in this section for elk, are equally applicable to black bears and should be exercised in order to avoid impacts to this species (Stewart 1989).

FIELD DEVELOPMENT

- In order to reduce *the potential for* incidents of game law violation all project workers should be instructed on local wildlife regulations and state wildlife laws and regulations posted in conspicuous places at the job sites. Personnel should also be instructed about the nature of the wildlife species which occur on the work site, potential impacts to these species and measures that could be taken to avoid or minimize impacts. Project workers should report bear sightings, raptor nests, and other noteworthy wildlife occurrences to the MDFWP.

- The use of off-road vehicles from or along project facilities (i.e., roads, facilities sites, pipelines, and well sites) should be prohibited.

- The drill sites and adjacent disturbed habitats should be reclaimed to approximate pre-project levels for vegetative cover and physical condition in the event of a dry hole. During reclamation a variety of forage species that are useful to resident herbivores should be established (See Appendix D of the EIS).

- *Aerial* surveys should be conducted to locate and determine the status of raptor nests that may be present within the area of influence of the field development activities. This survey should include (1) a search of the limestone cliffs in Sections 1, 11 and 12 (T9S R20E) and Section 6 and 7 (T9S R21E) for prairie falcon nests and (2) a search for peregrine falcon and golden eagle nests in the cliff habitats immediately north and west of proposed well sites. Since the field records of Bruce Anderson (1989) indicate there may be a golden eagle nest in the cliffs near the head of Robertson Draw, this area should be checked prior to the commencement of the proposed drilling operation near the head of adjacent Mill Draw. Survey procedures should be conducted under the direction of the FWS and MDFWP in strict compliance with their specifications. In the event nesting activities are found, the FWS and the MDFWP should be consulted immediately and appropriate mitigation actions developed and implemented.

- Powerlines installed to service operations should either be buried underground or suspended from poles in configurations that make raptor electrocution impossible.

- If cross-country pipelines are installed they should be routed to avoid sage grouse leks, raptor nesting areas, and habitats of mountain plover and long-billed curlews. Field surveys to determine locations of such habitats along and adjacent to any proposed alignment should be conducted prior to construction.

- Strict standards for prevention and minimization of chances for an accidental spill or discharge of any chemical or petroleum product must be demonstrated. If such an accident does occur, the USFWS Endangered Species Office in Billings, the MDFWP in Red Lodge, and the FS in Red Lodge must be notified to evaluate the effects on wildlife.

- In order to maintain an on-going assessment of the effectiveness of prescribed mitigation measures and obtain a specific measure of elk response to the field development program, it is recommended that the elk study currently being conducted by Dr. Fred Van Dyke be continued into the field development program.

species would be implemented in consultation with the USFWS (e.g. imposition of time-frame restrictions on road construction and operational road traffic to protect young birds on the road, reduced speed limits in high risk areas, etc.).

- Delay the commencement of drilling in the late spring until June 15 to ensure that elk calves are old enough to travel safely with their cows and to guard against any displacement of elk from the spring range into hayfields in Wyoming.

- In order to minimize the probability of displacing elk from their seasonal transition, fall/rutting, winter, and calving habitats, project operations within designated elk habitats should be limited to the period extending between June 15 and November 15 during years of normal climatological events. During years of abnormal climatological events (drought, unseasonably early and heavy snow, extensive fire, etc.) drilling operations should be terminated on a designated date between September 15 and November 15, when or if FS officials, in consultation with Montana Department of Fish, Wildlife and Parks (MDFWP) biologists, determine that the continuation of operations beyond that date would have a significant negative impact on elk, according to the impact significance criteria defined in Section 4.6.2 of the EIS.

- *To insure the maintenance of some disturbance-free areas for elk during the fall period, do not conduct drilling, construction, or work-over operations on more than one site after September 15.*

- In the event that drilling cannot be completed in a single operational period (June 15-November 15), the drill rigs should be dismantled and removed from the elk range until June 15 the following spring. To avoid the possibility of elk developing a permanent or long-term avoidance behavior towards the drill site, and to encourage rotational use of the entire elk habitat, drilling activities should not continue through November 15 on any single drill site for more than two consecutive years.

- Road maintenance and construction work outside of designated elk habitats can be performed at any time without impacting elk.

- In order to facilitate big game movements and minimize the potential for injuries, road access ROWs should not be fenced.

- Because black bears are common in the area, steps should be taken to minimize the possibility of attracting them and to avoid possible human/bear encounters. All personnel should be informed and educated regarding actions and circumstances that are likely to result in human/bear encounters and the measures that could be taken to minimize the potential for such encounters. The prescribed Interagency Grizzly Bear Guidelines for food handling and storage and the disposal of garbage should be followed so as to minimize the possibility of attracting bears. No dogs or firearms should be allowed on the drill site or project. Any bear problems should be reported promptly to biologists of the MDFWP. The same climatological and time constraints, described previously in this section for elk, are equally applicable to black bears and should be exercised in order to avoid impacts to this species (Stewart 1989).

FIELD DEVELOPMENT

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APPENDIX B

Visual Resources

The impacts associated with the new well site and access road would be similar to those described for Alternatives A and B in the project EIS. However, if the proposed six separate wells were simultaneously drilled from each of the three drill sites with each drilling requiring one year, the drilling rigs could be in place (during the drilling season) for about six to ten years, depending on drilling problems encountered. The short-term impacts described for Alternative A would become long-term impacts under a field development scenario and would visually impact three miles of the face of the Line Creek Plateau for the duration of the drilling activity.

Site-specific locations have been proposed for the three storage tank batteries, with their tentative locations being adjacent to existing roads. There appears to be sufficient topographic diversity at each of the three sites to adequately screen the tanks from view. If selected sites are elevated and exposed, the visual impact would be more pronounced. Powerlines to each of the three storage batteries would increase the visual impact by adding foreign vertical elements to the characteristic landscape.

Short-term visual impacts associated with field development activities would include visual contrasts between the industrial character of the construction equipment, the drilling operation, and the characteristic landscape. In addition, heavy volumes of truck traffic and fugitive dust could produce negative visual impacts beyond the immediate site. Long-term visual impacts could be associated with the industrial nature of production facilities in contrast to the natural landscape. Both short-term and long-term impacts to the visual resource would be possible where patterns of area, line, form, color, and texture in the existing characteristic landscape would be visually contrasted by drilling equipment and/or construction-related damage to vegetation, topography or other visible site features. The severity of impact depends upon the reclamation potential of the landscape disturbed and the level of visual disturbance created by the proposed action. The duration of the impact would be a function of the time required to complete the action and the time required for the site to return to a predisturbance condition. In general, impacts would be most severe on sites where mitigation would be difficult and/or where visual contrast would be highly visible to potentially large numbers of viewers.

Pipelines are typically constructed in straight alignments regardless of topography and vegetation. The resulting lineal pattern can contrast with undisturbed landscape. The visual impacts are most pronounced in areas where the pipeline would not be constructed within access road ROW or where the proposed route crosses steep topography, crosses areas of dense and uniform vegetation, and/or where screening vegetation is minimal.

Site-specific evaluation of all proposed site disturbances is recommended for adequate prescription of specific mitigation measures. The following general mitigation measures are recommended:

- Well Sites: To minimize short-term adverse visual impacts associated with production drilling activities, maintain existing site-screening vegetation by removing as few trees and large shrubs as possible. Minimize site disturbance in general. After completion of well construction and drilling operations, recontour segments of the well site not needed for production and revegetate to minimize long-term impacts. All permanent equipment and structures should be

painted a non-reflective color that blends with the surrounding colors and tones of the native environment.

- Access Roads and Pipelines: To reduce the short-term adverse impacts associated with road construction, take steps to minimize fugitive dust. During construction, protect existing vegetative cover at the edge of the ROW. Revegetate cut and fill sections on all access roads with indigenous species or adapted species that match native plant community character and phenology. Planting should occur at the earliest suitable planting date. The same recommendation applies to revegetation of all ROWs. Remove all post-construction debris immediately after construction.

- Locate production facilities in topographically low positions to minimize visual access. All permanent equipment and structures should be painted a non-reflective color that blends with the surrounding colors and tones of the native environment.

Recreation

Field development activities would have long-term and substantial adverse recreation impacts. The proposed field development facilities on FS-administered land would be inconsistent with the current ROS designation of the affected area (SPM), requiring a redesignation of approximately 1,900 acres from SPM to RN. This would involve close to 40 percent of the SPM acreage in the analysis area and would therefore represent a notable impact on the recreation opportunity characteristics of the area.

Field development would also result in a substantial displacement of existing recreation uses in the affected area. Assuming that the several wells proposed for each drilling site would be developed sequentially, the duration of drilling activities could easily extend for a period of six to ten years or longer, even if all three drill sites were developed simultaneously. During this period the quality of opportunities for hunting, hiking, and other dispersed recreation would deteriorate.

Noise and visual impacts generated by well field activities would extend over a much broader area than would occur with a single exploratory well. As a result, hikers and other dispersed recreationists would experience decreased satisfaction with the recreation qualities of the setting. Those recreation users who prioritize the isolation and solitude of undeveloped recreation settings would likely choose not to use the area.

Hunting would be negatively impacted by field development, due in part to adverse effects on the quality dimensions of the recreation setting. The scale of field development activities would impact a much larger contiguous area of the Line Creek Plateau face than would occur with a single well. Consequently, hunters would have difficulty redistributing themselves into adjoining areas. Moreover, any redistribution of hunting pressure into other available areas within the affected hunting unit would contribute to increased crowding and decreased hunter satisfaction. In addition, the level of project-related road development and road use resulting from field development could affect hunting for pronghorn antelope, deer, and upland game on public and private lands east of the Forest boundary. Project traffic would also interfere with motorized recreation use of the Meeteetse Trail and other public roads in the area east of the Forest boundary.

These impacts would remain substantial throughout the entire drilling period, which as noted above would likely last for six to ten years or longer. Following completion of drilling, the impacts of a production well field would be somewhat lower. Nevertheless, there would still be long-term impacts on the recreation opportunity characteristics of the area as a result of enduring visual effects, noise, and other evidence of increased human activity.

The magnitude of these adverse effects could be reduced by implementing appropriate mitigation procedures.

- The magnitude of impacts could be reduced by developing only one drill site at a time after September 1 and not drilling at the same location the following year. This would minimize the area of disruption during the drilling activity, when adverse impacts tend to be most severe. Although this approach would extend the duration of drilling activity over a considerable time period, it would provide better opportunities for redistribution of recreation use into areas not immediately adjacent to the drilling location.

Socioeconomics

Social. Field development activities could give rise to more substantial social impacts than would result from a single exploratory well. Although the level of public controversy generated by proposals for smaller-scale petroleum projects in the Red Lodge area is moderate, consideration of field development activities would be likely to act as a catalyst for increased dissatisfaction among wildlife interest groups and various other environmental preservation interests. Concern and opposition among area residents who prioritize tourism and recreation as the focus of economic development opportunities could also be anticipated. One result would be an increased potential for local community conflict between those who prioritize the economic benefits and opportunities that could result from petroleum development and those who advocate the maintenance and preservation of natural environmental conditions or who prioritize economic growth based on recreation and tourism (Greider and Little 1988).

In addition, the rural lifestyles currently experienced by some residents of ranches and small communities located near to the well field location could be significantly altered. The levels of traffic, road upgrading, and other project activities associated with well field development would remain high throughout the period of drill site development and drilling activity. These activities could alter the solitude and isolation experienced by individuals living at the handful of ranches and homes dispersed in proximity to the various access routes.

Large-scale field development could result in levels of in-migration by project personnel that could strain the ability of local communities to absorb increased demands for housing, public services, and other infrastructure. Such population growth could also disrupt the operation of established social structures that provide informal mechanisms of social support, social control, and social integration in rural communities (Freudenburg 1986). Such impacts would be of limited magnitude due to the limited extent and scale of this field development project.

If the drilling and development activities were spread over a relatively long time period, the size of the project workforce and the degree of in-migration occurring during any single time period would be reduced. In contrast, rapid development of field

facilities would likely require a larger workforce and could generate in-migration sufficient to cause adverse impacts on the lifestyles of local residents. But any in-migration would likely be of short-duration during construction and drilling. Such impacts could be more severe if project workers were to locate in smaller communities, such as Bear Creek and Belfry, that are located nearest to the project area.

Economics. The economic impacts of field development would generally involve net positive effects on revenue flows in the affected counties and communities. Negative economic impacts could include some loss of recreation-related employment and revenues and increased costs for public service provision. However, these would be substantially offset in the aggregate by increased property taxes, revenues generated by the state severance tax and the county net proceeds tax, and increased employment and wages generated by the project.

The economics of the proposed Ruby A Federal Prospect change substantially if the well indicates commercially feasible quantities of oil. The following discussion extends the Socioeconomic Sections of Chapters 3 and 4 in the EIS to include the economic ramifications of oil production from the Ruby Creek area.

Phillips indicates that the preferred oil extraction strategy would involve three sites, each containing six wells. The wells would be drilled simultaneously. The limited period each year in which drilling could occur implies that drilling and completing each well would take, on the average, one season. The effective project life is therefore about 20 years: 6 to 10 years for drilling and 10 to 14 years of production after the final well is drilled. Production is estimated at 350 barrels of oil per day for the life of the field.

Table B-2 summarizes the economic impacts of oil production from this size facility. As with the exploratory well, the economic impacts come from tax revenues, community revenue flows, and changes in non-market values. In each of these three areas, however, the size of the impacts changes substantially. Production would also generate substantial federal royalties but those are not applicable to this locally defined analysis area and are therefore not included in Table B-2. Additional beneficial economic impacts could occur beyond the project area and include state and federal revenues. However, the analysis does not directly consider these additional revenues since they would occur outside of the immediate area of interest. In 1988, the federal oil and gas estate in Carbon County returned $737,360 to the state and an equal amount to the federal government. The state redistributes some of these funds under an equalization formula for public education (Jaquith 1989). Thus, Carbon County would receive a portion of the state revenues derived from development of this oil/gas field.

The addition of oil production means that two new taxes would be levied against the development project: the Montana oil and gas severance tax and the county net proceeds tax. The details of calculating these taxes, as well as the property tax, are shown in Table B-3. Table B-2 shows that the present net value of these taxes is likely to be substantial at the anticipated production levels.

The community revenue flows are the inflows of money into the local economies that are attributable to the development proposal, given a production scenario. The categories of expenditures that are expected to be partially captured by local businesses or workers are drilling and maintenance crew wages, pipelines, site and road construction and reclamation, and drilling intangibles. No multipliers are used to estimate community revenue flows because the objective is to measure inputs to, rather

Table B-2. Economic Impacts of Production.

	No Action	Proposal
Property Taxes		
Drilling Equipment	0	2,104,818
Pipeline	0	862,077
Tanks	0	50,752
County Net Proceeds Tax	0	4,352,451
State Severance Tax	0	17,409,895
		24,779,993
Revenues to Community		
Crew Wages		
Drilling	0	1,251,877-1,564,848
Maintenance	0	402,995-503,744
Construction and Reclamation		
Drill Sites and Roads	0	414,425-518,031
Pipeline	0	133,056-310,464
Drilling Intangibles	0	698,109-1,628,920
		2,900,462-4,226,007
Non-priced Values (RVDs)		
Hunting and Fishing	82,263	36,821
All Other Recreation	112,082	38,694
	194,345	75,515

Assumptions: 3 sites, 6 wells per site; 1 well per site every 2 years; wells produce 350 barrels/day for 10 years; 4 percent discount rate; tax codes remain constant; recreation by 80 percent for the 12 year construction and drilling period, and by 20 percent for the following 10 year production period.

than movements through, the local economies. One direct local impact that may occur is a change in property values to the private lands adjoining the FS boundary near Ruby Creek (particularly the currently undeveloped Towe subdivision). There are no data available with which to predict any property value changes attributable to the proposal.

The non-market value changes (i.e., non-priced values) would result from either lost recreation use or diminished quality of remaining recreational activities. This measure of recreation value is not merely recreationist expenditures or license fees, but is based on the more comprehensive concept of willingness-to-pay. Table B-2 arbitrarily assumes that 80 percent of the recreation value would be lost in the recreation analysis area during the 12 year construction and drilling period, and by 20 percent during the 10 year production period. This area is described in Recreation sections of Chapter 3 of the EIS, and includes about 4,920 acres. The sources of this loss are: 1) reduced

Table B-3. Tax Revenue Calculations.

State Severance Tax

For wells with production less than 10 barrels per day:
1-5 barrels per day exempt from tax
Additional production taxed at 0.03 of gross value.

For wells with production greater than 10 barrels per day:
All production taxed at 0.05 of gross value.

All wells exempt from this tax for the first 24 months of operation.

County Net Proceeds Tax

Net proceeds are gross proceeds minus qualified expenses.

Tax is net proceeds multiplied by appropriate mill levy.

All wells exempt from this tax for the first 12 months.

Property Tax (on drilling equipment)

Rig value multiplied by taxable value percentage (11% for all drill rigs).

Taxable value multiplied by appropriate mill levy.

Prorated by proportion of year in state.

Source: Chenoweth 1988, Steinmaisal 1988

recreation use in the immediate project area, 2) reduced willingness-to-pay for the remaining use in the project area, and 3) reduced willingness-to-pay for recreation at other sites that experience higher use levels because of recreationists displaced from the project area. There are additional non-market values (water and forage) and financial effects (license sales) that are not included in this analysis because data is not available.

Table B-2 shows that there would be substantial net local economic benefits if the Ruby Creek drilling proposal resulted in oil production. The tax revenues to state and county governments are two orders of magnitude larger than the lost non-market values, and the community revenue inflows are one order of magnitude larger. This result merely reinforces the obvious conclusion that oil wells can be lucrative but does nothing to address the distributional issues. These latter issues are important because the proposal would most likely negatively impact some people while disproportionately benefiting others. The net aggregate fiscal effects would nevertheless be positive. Moreover, the tax and community revenues are so much larger than the non-market

losses that even if there is uncertainty about the size of any single value, it should not produce uncertainty about the aggregate result.

Cultural Resources

Cultural resources on public lands, including archeological sites and historic properties, are protected by various laws and regulations dating as far back as the Antiquities Act of 1906. The specific directives can be found in "Archeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines" (Federal Register 1983). Archeological sites and historic properties are evaluated based upon their eligibility for the National Register of Historic Places. Legislation has created a screening process that provides for protection of only the most significant sites. Protection for sites can only be assured if the sites meet eligibility requirements for the National Register.

National Register criteria (36 CFR 60.4) define four categories of significance based upon "the quality of significance in American history, architecture, archeology, and culture present in districts, sites, buildings, structures and objects of state and local importance that possess integrity of location, design, setting, materials, workmanship, feeling, and association; and that:

- o are associated with events that have made a significant contribution to the broad patterns of our history; or
- o are associated with the lives of persons significant in our past; or
- o embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- o have yielded, or may be likely to yield, information important in prehistory or history."

Specific criteria are developed by the State Historic Preservation Office (SHPO) in consultation with the Federal management agencies. Applicants for Federal permits consult the applicable SHPO to determine the presence of known resources or the need for additional surveys. This consultation shall lead the applicant to develop a cultural resource management plan which outlines procedures to identify, evaluate, and protect or mitigate adverse effects to National Register and eligible sites and properties. Such plans may be implicit for small projects but must be formalized in areas of major impact. The plans would follow regulations established by the Advisory Council on Historic Preservation (51 CFR 31115, 1986).

Sites are generally not eligible for the National Register of Historic Places if they lack diagnostic artifacts, subsurface remains, or structural features. Sites that cannot be placed in a temporal context or related to other sites are usually not eligible and therefore cannot officially be protected. Much of the Forest land has not been adequately surveyed, and sites lacking the criteria of context may eventually become important if related to other sites that have not yet been discovered. Any archeological resource discovered on National Forest lands has an unknown significance if discovered in an area where little previous survey has been performed. Sites should be considered potentially eligible unless evidence to the contrary is overwhelming.

FIELD DEVELOPMENT

The Advisory Council on Historic Preservation has developed guidelines for determining adverse impact for any site on or eligible for nomination to the National Register of Historic Places [36 CFR 800.9 (b)(1),(2),(3)].

Significant impacts to Cultural Resources consist of the following:

1. Destruction or alteration of all or part of a property.

2. Isolation of a cultural resource from or alteration of its surrounding environment.

3. Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting.

4. Neglect and subsequent deterioration.

These adverse effects could be in the form of direct, indirect, or cumulative impacts. Direct impacts are physical, and adversely affect the site or its setting. Construction activities would be the primary direct impact affecting sites or structures. Indirect effects would not immediately result in physical alteration of the site or its setting. A new access road into an area containing significant sites or structures would allow public access and exposure of the properties. Artifact collection or similar activities could physically alter the site. If such activities were sporadic, their effects over a period of time would be cumulative. Gauging the effect of any impact depends on the level of information available from the inventory. If cultural resources on or eligible for the National Register of Historic Places are to be adversely impacted by the proposed project, then the applicant, in consultation with the SHPO and the surface management agency, shall develop a mitigation plan. Construction would not proceed until terms of the mitigation plan are satisfied.

A Class III walkover archeological survey was performed on 13 miles of access road corridors associated with the access route variations described in the EIS. These route variations are all located off the National Forest on BLM or private lands.

Five properties were either located or re-visited during the course of the survey. These properties (described in Chapter 4 of the EIS) include the Meeteetse Trail, and are all recommended for nomination to the National Register of Historic Places under Criteria D.

A file search of the Montana State Historic Preservation Office revealed that there are no sites on or eligible for the National Register of Historic Places in the project area on Forest lands. Cultural resources would likely not be directly impacted in the project area on Forest lands. Secondary effects from the construction of the access road, drill sites, pipeline corridors, and production facilities could include adverse impacts to presently undiscovered sites or properties in areas near the proposed action. There is no evidence to suggest that the area has religious significance to existing Native Americans.

A Class III walkover survey on areas proposed for field development activities (e.g., pipelines, production facilities) would be necessary to identify other properties that are on or eligible for the National Register of Historic Places. Consultation with the Montana State Historic Preservation Officer (SHPO) would be necessary to develop suitable mitigation plans.

Based on the Class III walkover archeological survey and information acquired on the access route variations, the potential exists for impact to known cultural sites through field development activities. Disturbance and/or loss of other unidentified sites or artifacts could add to the cumulative loss of heritage information in the project area and in the region if these sites or resources are not identified and inventoried prior to disturbance.

The following mitigation items are recommended:

- Require a Class III walkover survey on areas having any proposed new construction. Construction would include new road construction, widening of the roadway of existing roads, production facilities site construction, and pipeline corridors.

- Additionally, if any cultural values are observed during construction operations, they should be left intact, and the District Ranger, Beartooth Ranger District, or the *Area Manager of the BLM, Billings Resource Area,* should be notified. The ranger/manager would request Phillips to conduct an evaluation of the cultural values and prepare a suitable mitigation plan.

Health and Safety

Potential risks associated with field development include the following:

- A low risk of exposure to hydrogen sulfide (H_2S) concentration due to an equipment failure or disaster during drilling or completion operations.

- The normal risks associated with traffic, heavy construction, pipeline construction, and drilling operations.

There is a possibility of encountering H_2S in the Phosphoria, Tensleep, and Madison Formations. Phillips has anticipated this possibility and has prepared a Contingency and Evacuation Plan for exploratory drilling that addresses the accidental release of H_2S during drilling (Appendix E). The purpose of this plan is to safeguard the lives of the public, contract personnel, and company personnel in the event of equipment failures or disaster during drilling or completion operations in formations that may contain H_2S gas. This plan also specifically addresses methods to minimize hazard to any residences in the project area, specifically the summer home near the mouth of Ruby Creek canyon. All required safety equipment and training have been provided for in this plan. Although this plan has been specifically developed for exploratory drilling, similar techniques and precautions would be used during production. Since Phillips recognizes the potential for emission of H_2S and plans to implement state-of-the-art contingency plans, significant impacts to public heath and safety is unlikely.

Short-term health and safety impacts would occur during the maintenance and construction of the field development road system, with possibly some effect on the existing public traffic. This increase in traffic volume would have a tendency to increase accidents during all phases of construction and drilling operations. Hazards associated with the well sites and production facilities, including construction and operation, are the ones normally associated with heavy construction and industrial work.

FIELD DEVELOPMENT

SUMMARY

As part of the federal, technical, and environmental review process, proposals for further oil and gas development in the leasehold would be subject to environmental analysis requirements of NEPA and the implementing regulations of the Council on Environmental Quality (CEQ). Once a conceptual field development proposal is submitted by Phillips, the BLM and FS would complete an analysis of all aspects of the field development proposal, and prepare the appropriate environmental document. As required by NEPA, the environmental review would include a formal process for identifying public and agency concerns regarding the development activities. The environmental analysis would specifically address the potential environmental impacts of the proposed field development activities and feasible alternatives. The analysis would be distributed for public, state, and federal agency review and comment. All comments received would be considered in the BLM and FS decision-making process.

Any proposed field development activities in the Phillips leasehold would also be subject to the permitting processes of the State of Montana. Depending on the nature and extent of the conceptual field development plan, field development activities may require additional or concurrent state environmental review under rules applicable in Montana. All federal and state requirements would be coordinated.

APPENDIX B

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APPENDIX C

Engineering Analysis:

Bridge Reconnaissance Report

APPENDIX C

Engineering Analysis:

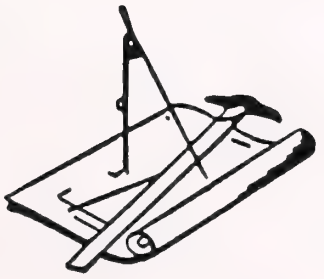
Bridge Reconnaissance Report

BRIDGE RECONNAISSANCE REPORT

SOUTH ACCESS ROUTE

EXPLORATORY WELL
RUBY FEDERAL A19

14 DECEMBER 1988



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BRIDGE RECONNAISSANCE REPORT

SOUTH ACCESS ROUTE

EXPLORATORY WELL
RUBY FEDERAL A1-9

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I INTRODUCTION

It is proposed that an exploratory well be constructed in the NW¼NW¼ of Section 15, Township 9 South, Range 20 East of the Montana Meridian, Carbon County, Montana. The site is approximately 3 miles North of the Wyoming/Montana State line in the Custer National Forest. Two access routes to the site are possible. Both routes extend Westerly from Montana Highway 397. And, both access routes utilize existing gravel roads that cross private lands, Bureau of Land Management lands and National Forest Service lands. Both the North and South routes must be improved for use as a well site access. The improvements may include grading, shaping and gravel surfacing, widening in some areas and installing storm drainage piping for conveyance of surface water. Only the Southern route requires crossing the Clarks Fork of the Yellowstone River.

The Southern route crosses the Interstate Irrigation Ditch and the Wills Irrigation Ditch. The Wills Ditch is crossed by a concrete box culvert. The Interstate Ditch is crossed by a modified railroad car. Improvements to the Interstate Ditch crossing will be required.

PURPOSE

The purpose of this reconnaissance report is to present a cursory evaluation of the adequacy of an existing bridge over the Clarks Fork of The Yellowstone River for the Southern access route.

OBJECTIVES

The objectives of this report are to identify ahead of preliminary and final design and ultimately construction, the cost effectiveness, the constructability, and the environmental compatibility of providing improvements to the Southern access route river crossing. The improvements to be identified herein are limited to the river crossing. Specifically, the objectives of this reconnaissance report are as follows:

- Identify the condition of the existing structure
- Establish criteria for a crossing

- Identify improvements to and costs of utilizing the existing structure
- Identify alternatives to the existing structure with cost estimates
- Provide recommendations for improvements to cross the Clarks Fork of the Yellowstone River

FINDINGS AND CONCLUSIONS

The following are the findings and conclusions of this reconnaissance report that led to the recommendation:

- The existing steel truss bridge is generally, in good condition
- The existing bridge will not carry anticipated loads without modifications
- The existing bridge is rated at 8 tons maximum
- The existing bridge is 16 feet wide (single lane) and spans 200 feet
- A detailed analysis of the existing bridge was not performed
- Normal highway load limits are 18,000 pound axle and 80,000 pound gross weights
- For this report, oversized load limits of 20,000 pound axle and 100,000 pound gross weights were used
- A river ford and a temporary pontoon type bridge were rejected as viable alternatives
- Constructing a new bridge is a viable alternative
- The estimated project costs of a new bridge are $470,000
- A new bridge would be two lane with a sidewalk that spans 200 feet and is 30 feet wide
- Temporarily modifying the existing bridge is a viable alternative
- Modifying the existing bridge would cost approximately $166,000
- Construction time of modifying the existing bridge is the shortest
- The environmental effects of the existing bridge modifications would have the least impact

RECOMMENDATION SUMMARY

If the Southern access route to the well site is selected, the existing bridge modifications alternative is recommended. The costs are estimated to be the least, environmental effects are the least and construction time is the least.

II EXISTING CROSSING

The existing crossing is a through truss steel bridge crossing the Clarks Fork of the Yellowstone River. It is approximately 1,000 feet West of Montana Highway 397 beyond the Wills Irrigation Ditch. And, it is in the NW¼NW¼ of Section 29, Township 9 South, Range 22 East of the Montana Meridian, Carbon County Montana. It is assumed that the bridge is part of an unmarked county road that intersects with Montana Highway 397 2.2 miles North of the Wyoming State Line.

The bridge is supported at each end by concrete abutments and spans 200 feet. The concrete contains some cracks but, appeared to be in good condition. No spalling was observed.

Due to the age of the bridge, it is assumed that A-7 steel was used. The bridge is made of 10 panels, each pin connected, 20 feet in length. Nine I-beams 15"X5½", 16 feet long serve as cross members at the bottom of each panel. The cross members support eight longitudinal I-beams 10"X4½" that support asphalt over wood plank bridge decking. The wood planks are 2"X6" rough lumber turned on end and placed accross the longitudinal I-beams (16 feet±)

The main overhead frame members are a box beam made of two 10"X23/4" channels with a riveted steel plate on top and latice steel on the bottom. Maximum overhead clearance between the deck and sway bracing is 14 feet 9 inches.

For the limited scope of this report, detailed design drawings and calculations of the bridge were not obtained or generated. A load limit sign placed in front of the bridge states 8 tons maximum. Based on our observations, we believe the maximum load limit is conservative and, is the result of the wooden deck.

III CROSSING ALTERNATIVES

LOAD CRITERIA

Normal highway load permits are issued for maximum 18,000 pound axle loads and 80,000 pound gross weight. Oversized load permits are also issued. It may be more economical to transport certain equipment and materials that would exceed normal permit load limits.

For the purposes of this report, we have selected 100,000 pounds gross weight on two pairs of duel axles and one single axle. Maximum axle loading selected for analysis is 20,000 pounds.

ALTERNATIVES ANALYSIS

Several alternatives for crossing the Clarks Fork of the Yellowstone River were considered. The alternatives included modifying the existing steel truss bridge, removing the existing bridge and constructing a new bridge, constructing a temporary river ford, and placing a temporary pontoon type bridge.

River Ford

A temporary river ford was rejected as a viable alternative for two main reasons. The obvious reason is the large quantity of flow in the river during low runoff periods. The second, and perhaps less obvious reason, is the environmental damage that may be caused by a river ford.

Pontoon Type Bridge

A temporary pontoon bridge crossing was also rejected as an alternative for analysis. Constructability, cost and environmental damage were the main reasons. Although flow in the river is large, it is believed that a pontoon bridge would bear on the river bottom for much of its span. The costs of purchasing, installing and removing a pontoon bridge would be better applied to another alternative. And, the impact to the environment for 6 months may be significant.

Truss Bridge Modifications

Although the specific capabilities of the existing bridge are unknown, it is possible to temporarily modify it to carry anticipated loads. The modifications would include placing two steel girders, on independent concrete foundations, under the existing cross members, replacing the wood and asphalt decking with adequate steel grate decking, and miscellaneous truss restoration.

The required steel girders would be approximately W36X300 (wide flange) 200 feet long. The 36 inch depth of the girders could interfer with the high water or flood elevation of the river and could act as a dam during periods of high water. Therefore, this alternative is considered to be temporary and, the girders would be removed.

Constructability

Constructability of this alternative is practical and would not interfer with the flow in the river or significantly impact the environment. Independent concrete foundations would be placed in front of the existing bridge abutments to support the steel girders. One month cure time would be required for the concrete. It is estimated that total construction time would be 2½ months and removal time would be 2 weeks. During construction, an identical bridge 1.2 miles South could be used for access to the West side of the river.

Opinion of Costs

Based on these preliminary evaluations, the estimated project costs for modifying the existing steel truss bridge are as follows:

Construction			
	Concrete	$20,000	
	Steel	40,000	
	Shop Fabrication	10,000	
	Erection	10,000	
	Decking	30,000	
		SUBTOTAL	$110,000
Removal			10,000
		SUBTOTAL	$120,000

Contingency	$ 18,000
Engineering Design (preliminary & final)	14,000
Engineering Services During Construction	10,000
Administration (permiting, legal, etc.)	4,000
Estimated Total Project Cost Truss Bridge Modifications	$166,000

NEW BRIDGE

Removing the existing bridge and constructing a new bridge would be a major improvement over the existing crossings in the immediate area. For this report, the existing road alignment would be maintained although analysis may show that another alignment is more desireable. The existing truss bridge including concrete abutments would be removed. A new bridge would span 200 feet and would be 30 feet wide. The existing bridge would be two lane with a walkway. This alternative would include reconstruction of approaches, concrete abutments, steel girder framework and a concrete deck.

Constructability

Since a bridge 1.2 miles to the South could be used for access, removing the existing bridge would not present a problem. Most of the construction work could be done without interference with the river flow. And, little environmental impact would be experienced. Concrete cure time would extend the time of construction. For removal and construction, it is estimated that 4 months time will be required. In addition, construction should be performed during the low flow periods,

Opinion of Costs

Removal			
	Bridge	$10,000	
	Concrete	5,000	
	SUBTOTAL		$ 15,000
Construction			
	Concrete Abutments	$50,000	
	Concrete Deck	95,000	
	Steel Framework	180,000	
	Approaches	5,000	
	SUBTOTAL		330,000
	SUBTOTAL		$345,000

Contingency	$ 52,000
Engineering Design (preliminary & final)	40,000
Engineering Services During Construction	28,000
Administration (permiting, legal, etc.)	5,000
Estimated Project Costs New Bridge	$470,000

IV RECOMMENDED PLAN

Based on the outline cost estimates, modifying the existing structure is the most desirable alternative. The project costs of the modifications are $166,000 compared to $470,000 for a new bridge.

It should be noted that nodifying the existing bridge is a temporary measure to meet the short term needs of the exploratory well. A new bridge would be a more permenant solution that would meet the well needs as well as future needs.

Ease of construction of the bridge modification would be greater than a new bridge. And, the construction time is less. Given the summer of 1989 to construct the exploratory well, it would be very difficult to construct a new bridge at this late date.

If the Southern access route is selected as the access route to the well site, we recommend modifying the existing steel truss bridge.

APPENDIX D

Site-specific Erosion Control, Revegetation, and Rehabilitation Plan (ERRP)

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Site-specific Erosion Control, Revegetation, and Rehabilitation Plan (ERRP)

SITE-SPECIFIC EROSION CONTROL, REVEGETATION, AND REHABILITATION PLAN (ERRP)

For the

Ruby A Federal No. 1-9 Exploratory Oil/Gas Well Project

Carbon County, Montana
Beartooth Ranger District
Custer National Forest
Red Lodge, Montana

Prepared for

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EROSION CONTROL, REVEGETATION, AND RECLAMATION PLAN

INTRODUCTION

The following site-specific Erosion Control, Revegetation, and Rehabilitation Plan (ERRP), if properly implemented, is designed to successfully reclaim disturbed areas associated with Phillips Petroleum Corporation's Ruby A Federal No. 1-9 Exploratory Well project as described and analyzed in detail in the EIS. The disturbed areas to be reclaimed include a drill site, new access road, and reconstruction of unimproved two-track roads. The exact nature and area of disturbance depends on which alternative is permitted by the Forest Service (FS) and Bureau of Land Management (BLM). These alternatives are described in the EIS and include Alternative A which is Phillips' proposed Ruby Creek drill site and access route including a variation drill site, and Alternative B which is the alternative Gold Creek drill site and access route (see Exhibits 2-1, 2-2, and 3-2). In addition, three access route variations to Alternative A, Variations A2, A3, and A4, have been identified by the FS and BLM as possible and feasible routes to access the Alternative A drill site. These route variations are shown on Exhibit 3-2 of the EIS. Table D-1 summarizes the area of disturbance in each vegetation cover type by class of construction for both alternatives and variations. These vegetation cover types are described in the Vegetation, Timber, and Range Resources section of Chapter 3 of the EIS and in the Vegetation, Timber, and Resources Technical Report for this project (Grah and Crane 1989).

Since the project has not been permitted at this time, specific circumstances relevant to reclamation are unknown. For instance, at this time there is no indication of which alternative would be permitted. Similarly, the duration, timing, and management of construction activities are also unknown. This ERRP assumes that all disturbance associated with this proposal would be reclaimed and revegetated to predisturbance conditions including the reconstructed unimproved two-track roads. These roads would be fully obliterated and reclaimed on lands administered by the BLM. Where these roads traverse privately owned land, reclamation would be negotiated with or as prescribed by the land owner.

This ERRP applies only to the construction and exploration phase. Should the well be a producer, the well would be "shut-in" and all disturbed areas stabilized with mulch and revegetation while additional environmental analysis is completed for the production phase. An additional separate ERRP would be prepared for all production facilities.

Although successful reclamation of all the vegetation types listed in Table D-1 is feasible as established in the EIS, reclamation potential of the disturbed soils is generally poor to fair. This relatively low rating is due to the droughty nature of the soils caused by high sand and coarse fragment contents, poor fertility, and limited topsoil resources in some areas as described in the Soils section of the EIS. With the implementation of the aggressive reclamation methods presented in the following sections, successful reclamation can be attained.

Reclamation activities covered in this ERRP fall into two general categories including temporary reclamation and final reclamation. Temporary reclamation refers to measures applied to stabilize disturbed areas and control runoff and erosion during the construction and drilling phase. Generally, temporary reclamation is applied to such surfaces as road cut and fill slopes, topsoil and subsoil stock piles, and cut and fill

Table D-1. Disturbance[a] to Vegetation Cover Types Due to Road Construction and Reconstruction and Drill Pad Construction under Alternative A and Access Route Variations and under Alternative B.

ACTIVITY	Vegetation Cover Types[b] SS (mi)	SS (ac)	LP (mi)	LP (ac)	MC (mi)	MC (ac)	AF (mi)	AF (ac)	RI[c] (mi)	RI[c] (ac)	TOTAL Distance (mi)	TOTAL Area (ac)
ALTERNATIVE A												
Variation A1												
Road Reconstruction	8.5	20.6	0.3	0.7	0.0	0.0	0.0	0.0	<0.0>	<0.02>	8.8	21.3
New Road Construction	0.0	0.0	0.3	1.5	0.0	0.0	0.0	0.0	<0.0>	<0.00>	0.3	1.5
Subtotal	8.5	20.6	0.6	2.2	0.0	0.0	0.0	0.0	<0.0>	<0.02>	9.1	22.8
Drill Site	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	<0.0>	<0.00>	0.0	2.5
TOTAL	**8.5**	**20.6**	**0.6**	**4.7**	**0.0**	**0.0**	**0.0**	**0.0**	**<0.0>**	**<0.02>**	**9.1**	**25.3**
Variation A2												
Road Reconstruction	6.5	15.8	0.3	0.7	0.0	0.0	0.0	0.0	<0.0>	<0.02>	6.8	16.5
New Road Construction	0.0	0.0	0.3	1.5	0.0	0.0	0.0	0.0	<0.0>	<0.00>	0.3	1.5
Subtotal	6.5	15.8	0.6	2.2	0.0	0.0	0.0	0.0	<0.0>	<0.02>	7.1	18.0
Drill Site	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	<0.0>	<0.00>	0.0	2.5
TOTAL	**6.5**	**15.8**	**0.6**	**4.7**	**0.0**	**0.0**	**0.0**	**0.0**	**<0.0>**	**<0.02>**	**7.1**	**20.5**
Variation A3												
Road Reconstruction	5.5	13.3	0.3	0.7	0.0	0.0	0.0	0.0	<0.0>	<0.02>	5.8	14.0
New Road Construction	0.0	0.0	0.3	1.5	0.0	0.0	0.0	0.0	<0.0>	<0.00>	0.3	1.5
Subtotal	5.5	13.3	0.6	2.2	0.0	0.0	0.0	0.0	<0.0>	<0.02>	6.1	15.5
Drill Site	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	<0.0>	<0.00>	0.0	2.5
TOTAL	**5.5**	**13.3**	**0.6**	**4.7**	**0.0**	**0.0**	**0.0**	**0.0**	**<0.0>**	**<0.02>**	**6.1**	**18.0**

Table D-1. Continued.

ACTIVITY	Vegetation Cover Types[b] SS (mi)	SS (ac)	LP (mi)	LP (ac)	MC (mi)	MC (ac)	AF (mi)	AF (ac)	RI[c] (mi)	RI[c] (ac)	TOTAL Distance (mi)	TOTAL Area (ac)
ALTERNATIVE A												
Variation A4												
Road Reconstruction	8.9	21.6	0.3	0.7	0.0	0.0	0.0	0.0	<0.0>	<0.02>	9.2	22.3
New Road Construction	0.0	0.0	0.3	1.5	0.0	0.0	0.0	0.0	<0.0>	<0.00>	0.3	1.5
Subtotal	8.9	21.6	0.6	2.2	0.0	0.0	0.0	0.0	<0.0>	<0.02>	9.5	23.8
Drill Site	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	<0.0>	<0.00>	0.0	2.5
TOTAL	**8.9**	**21.6**	**0.6**	**4.7**	**0.0**	**0.0**	**0.0**	**0.0**	**<0.0>**	**<0.02>**	**9.5**	**26.3**
Variation Drill Site[d]												
Road Reconstruction	8.4	20.4	0.0	0.0	0.0	0.0	0.0	0.0	<0.0>	<0.02>	8.4	20.4
New Road Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	<0.0>	<0.00>	0.0	0.0
Subtotal	8.4	20.4	0.0	0.0	0.0	0.0	0.0	0.0	<0.0>	<0.02>	8.4	20.4
Drill Site	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	<0.0>	<0.02>	0.0	3.0
TOTAL	**8.4**	**23.4**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**<0.0>**	**<0.02**	**8.4**	**23.4**
ALTERNATIVE B												
Road Reconstruction	4.2	10.2	1.1	2.7	0.0	0.0	0.0	0.0	<0.0>	<0.03>	5.3	12.9
New Road Construction	0.0	0.0	0.9	4.4	0.0	0.0	0.0	0.0	<0.0>	<0.00>	0.9	4.4
Subtotal	4.2	10.2	2.0	7.1	0.0	0.0	0.0	0.0	<0.0>	<0.03>	6.2	17.3
Drill Site	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	<0.0>	<0.00>	0.0	3.0
TOTAL	**4.2**	**10.2**	**2.0**	**10.1**	**0.0**	**0.0**	**0.0**	**0.0**	**<0.0>**	**<0.03>**	**6.2**	**20.3**

a - A 20-foot-wide construction zone assumed for reconstruction of existing unimproved roads; a 40-foot-wide construction zone assumed for construction of new road.
b - SS=sagebrush scrub; LP=limber pine woodland; MC=mixed conifer; AF=alpine bunchgrass and forbland; and RI=riparian cottonwood and willow scrub.
c - Disturbance within riparian zone is less than 0.1 acre. This magnitude cannot be resolved for the other vegetation cover types.
d - Reduction in miles and acres of clearing from Alternative A Access Route Variations.

slopes associated with the drill pad. This also includes securing and stabilizing the disturbed site during a two- to three-year interim period if producible quantities of oil and/or gas were encountered. The interim period includes the time involved with conducting an additional NEPA analysis and for the FS and BLM to reach a decision concerning field development. Final reclamation refers to measures applied to all disturbed areas upon project termination. Generally, these measures entail regrading the disturbed areas to near predisturbance topography, respreading topsoil over the area, applying a prescribed seed mix, mulching with or without netting and/or tackifier, and placement of runoff and erosion control structures such as waterbars and silt fences.

Objectives

Short-Term (Temporary Reclamation):

- Immediately stabilize the disturbed areas by mulching and runoff and erosion control and through the initiation of new vegetation.
- Control and minimize surface runoff, erosion, and sedimentation through the use of diversion and water treatment structures.

Long-Term (In addition to Temporary and Final Reclamation):

- Restore primary productivity of the site and establish vegetation that will provide for natural plant and community succession.
- Establish a vigorous stand of desirable plant species that will limit or preclude invasion of undesirable species, including noxious weeds.
- Revegetate the disturbed areas with plant species useful to wildlife and livestock.
- Restore disturbed area to prior aesthetic characteristics and values.

Performance Standards

The following performance standards will be used to determine whether the objectives of the ERRP have been met at a given time:

All Years:

- protective cover - all disturbed areas to be left bare, unprotected, or unreclaimed for more than one month will have at least a 50 percent cover of protective material in the form of mulch, matting, or vegetative growth. This does not apply to work areas.

Second Year (Final Reclamation):

- o seedling density - the density and abundance of desirable (i.e., species) seedlings is at least 3 to 4 seedlings per linear foot of drill row (if drilled) or transect (if broadcast).

- o percent cover - total vegetal cover will be at least 50 percent of predisturbance vegetal cover as measured along the reference transect for establishing baseline conditions.

By the Fifth Year (Final Reclamation):

- o percent cover - total vegetal cover will be at least 80 percent of predisturbance vegetal cover as measured along the reference transect for establishing baseline conditions.

- o dominant species - 90 percent of the revegetation consists of species included in the seedmix and/or that occurs in the surrounding natural vegetation as measured along the reference transect for establishing baseline conditions.

- o erosion condition/soil surface factor - erosion condition of the reclaimed area is equal to or in better condition than that measured for the reference transect for establishing baseline conditions.

METHODS

Photomonitoring Points

Permanent photomonitoring points will be established at appropriate vantage points which provide adequate visual access along the new access road and at the drill site. Two photomonitoring points will be established at the permitted drill site. Two photomonitoring points will be established along the new access road. Permanent markers such as a re-bar, will be used to locate and establish each point. Each point will be located on a topographic map of the area. The location of each point will also be described in detail to assist in relocation from year to year. Photos will be taken at each point prior to initiation of construction. Photos, framing the same scene as previously taken, will be taken each year until the performance standards have been successfully met. These photographs will be included in a yearly report submitted to the authorized official (AO; i.e., FS and BLM) involved in the project and will provide visual support to the written findings.

CONSTRUCTION AND DRILLING PHASE

This phase consists of access road construction, stabilization and revegetation of the access road construction ROW, construction of the drill pad, well drilling, and placement of various runoff and erosion control structures. Temporary reclamation applies to this phase.

APPENDIX D

Existing Access Road Reconstruction (Unimproved Two-Track)

Construction of this portion of the access road will primarily involve major reconstruction of the existing road. Runoff and erosion control as well as revegetation of

disturbed areas are designed to be in place for the life of the access road which, under the current proposal, would be for two to three seasons during construction, drilling, and reclamation. This portion of the access road would not be left for vehicular use after the project has been completed. Upon project completion, the reconstructed road will undergo reclamation to restore the terrain and vegetation to predisturbance conditions as described under Final Reclamation.

Right-Of-Way Clearing, Topsoil Removal and Storage

Construction of this portion of the access road will involve clearing a minimal amount of woody vegetation generally less than 2 inches in diameter (i.e., sagebrush, willow, and/or cottonwood) along the margins of the existing road. Within the sagebrush scrub and riparian types all vegetation will be bladed from the ROW with the topsoil.

Topsoil will be selectively handled separately from subsoil materials. Topsoil will be stripped to a sufficient depth to provide for sufficient quantities of topsoil to be spread to a depth of 6 inches over the disturbed areas to be reclaimed. The topsoil will be bladed to the margins of the ROW and stockpiled along the margins of the ROW for redistribution over the disturbed ROW and cut and fill slopes upon completion of road construction. Topsoil will be stored separate from other earth materials to preclude contamination or mixing. Topsoil will be mulched and/or revegetated to reduce erosion and maintain fertility.

Road Construction

Major reconstruction of the existing road will be accomplished following standard cut and fill construction methodology as itemized in the Access Road Design Plans prepared by Phillips.

Livestock Control

All existing livestock control structures such as fences and cattleguards will be maintained or replaced. Where access requires the disruption of an existing fence, a cattleguard will be installed at the juncture such as at the Forest boundary beyond which grazing is not allowed.

Runoff and Erosion Control

Runoff and erosion control will be accomplished by implementing standard crossdrain, culvert, road ditch, and turnout design as provided in the Access Road Design Plans, as well as timely mulching and revegetation of exposed cut, fill, and road shoulders. All runoff control structures such as culverts will be sized to carry runoff from the 50- to 100-year storm event and will be constructed with riprapped entrances, exits, and energy dissipators. Water discharged from culverts, crossdrains, road ditches and turnouts will be directed into undisturbed vegetation away from all natural streams and drainages. Erosion and sedimentation control measures and structures, such as silt

fences, will be used to control runoff, erosion, and off-site sedimentation. Silt fences will be utilized at the base of all fill or disturbed areas within 100 feet of streams such as where the access roads cross and/or encroach the stream environment on Ruby and/or Gold creeks. Silt fences will be constructed following manufacturers specifications. All runoff and erosion control structures will be inspected periodically, cleaned out, and maintained in functional condition throughout the construction, drilling and reclamation period. Exhibit D-1 presents a schematic of waterbar and silt fence construction.

Topsoil Respreading and Seedbed Preparation

All topsoil will be selectively handled separately from other subsoil materials. In preparation for seeding, at least 6 inches of topsoil will be evenly respread over the road ROW cut and fill surfaces. If the topsoil is compacted, a spring tooth harrow equipped with utility or seedbed teeth, or similar equipment as approved by the AO, will be used to loosen and smooth the soil surface either after or in conjunction with fertilization as approved by the AO. If the topsoil is loose, it will be compacted sufficiently with a cultipacker or similar implement to provide a firm seedbed.

Seed Application

After completion of seedbed preparation, the seed mix presented in Table D-2, or a similar mix approved by the AO, will be applied to areas along the access road with topsoil. Seed will be planted in the fall prior to snow accumulation. Seed should preferably be applied with drill-type equipment such as a rangeland drill or brillion seeder. Where the microtopography of the disturbed areas does not allow the use of drill-type equipment or where areas are too small to warrant power equipment, seed will be broadcast applied at 2.5 times the application rate of drilled seed. A spike-toothed harrow or similar equipment will be used to cover the broadcast seed.

Fertilization

The results of the topsoil fertility analysis presented in the Soils Section of Chapter 3 of the EIS indicate that topsoil along all portions of the access road have low fertility levels due to low phosphorus and nitrate-nitrogen contents. To mitigate these fertility deficiencies, 80 pounds per acre each of available nitrogen, phosphorus, and potassium will be broadcast-applied. The fertilizer should be in a time release form. Fertilizer application will occur either prior to or in conjunction with seedbed preparation unless otherwise approved by the AO.

Mulching

The seeded cut and fill shoulders of the access road will be mulched to protect the soil surface against soil erosion, reduce evaporation and soil temperature fluctuations, and increase surface water infiltration and seedling germination and establishment. Mulching will be implemented by broadcast application of straw mulch or as approved by the AO. Mulch will be applied by a mechanical mulch blower at a rate of 2.0 tons/ac after seeding. The mulch will be crimped into the soil surface using a serrated disc crimper, or similar implement as approved by the AO. Only certified weed free straw mulch will be used. Certification will be provided by the county extension agent of the county in which the straw was grown. Hydromulching will be used on slopes in excess of 40 percent or on slopes exceeding the operating capabilities of the machinery.

Table D-2. Seed Mix[1] for Temporary Revegetation of Cut and Fill Slopes Associated with the Drill Site and Access Road as well as Topsoil Stockpiles.

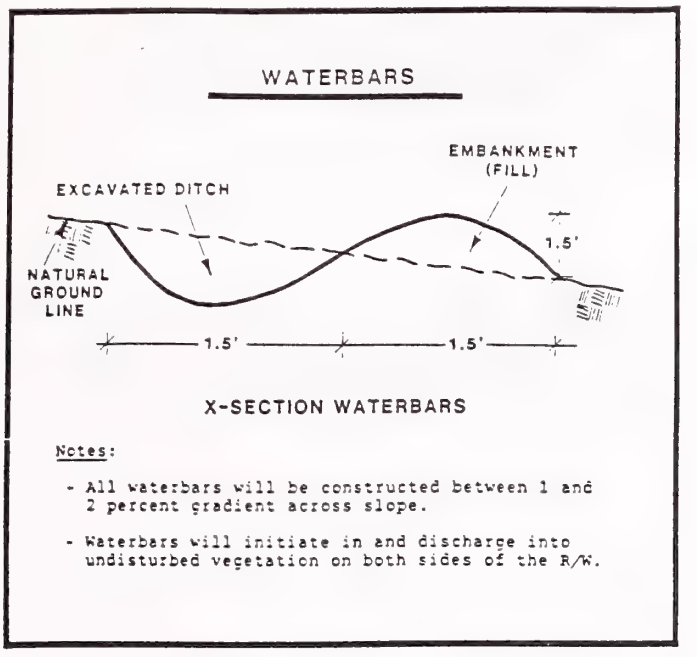
Species	Cultivar or Variety	Seed Application Drilled Rate (PLS[2] lbs/ac)	Planting Depth (in)
Grasses:			
Mountain brome	Bromar	3.0	0.5
Intermediate wheatgrass	Oahe	3.0	0.5
Slender wheatgrass	San Luis, Revenue Primar	2.5	0.5
Sheep fescue	Covar	1.0	0.5
Forbs:			
Lewis flax	-	0.5	0.25
Sainfoin	Eski	1.0	0.5
White sweetclover	-	1.0	0.25
Shrubs:			
None			
		12.0	

Suggested Alternate Species[3]		Replaces
Grasses:	Smooth brome	Mountain brome
	Thickspike wheatgrass	Intermediate wheatgrass
	Hard fescue	Sheep fescue
Forbs:	Utah sweetvetch	Sainfoin
	White yarrow	Lewis flax
	White sweetclover	Yellow sweetclover
Shrubs:	None	

1- Seed mix based on objectives previously listed: adaptation to project site conditions, usefulness for site stabilization, species success in revegetation efforts, and current seed availability and cost. Seed mixes have been developed with suggestions from the USDA Bridger Plant Materials Center, Bridger, MT.

2- PLS = pure live seed. If broadcasted, rates should be increased by a factor of 2.5.

3- Replacement species if suggested species are not available (substitution, if necessary, will be directed by the Authorized Officer). Coordinate with the USDA Bridger Plant Materials Center for replacements.



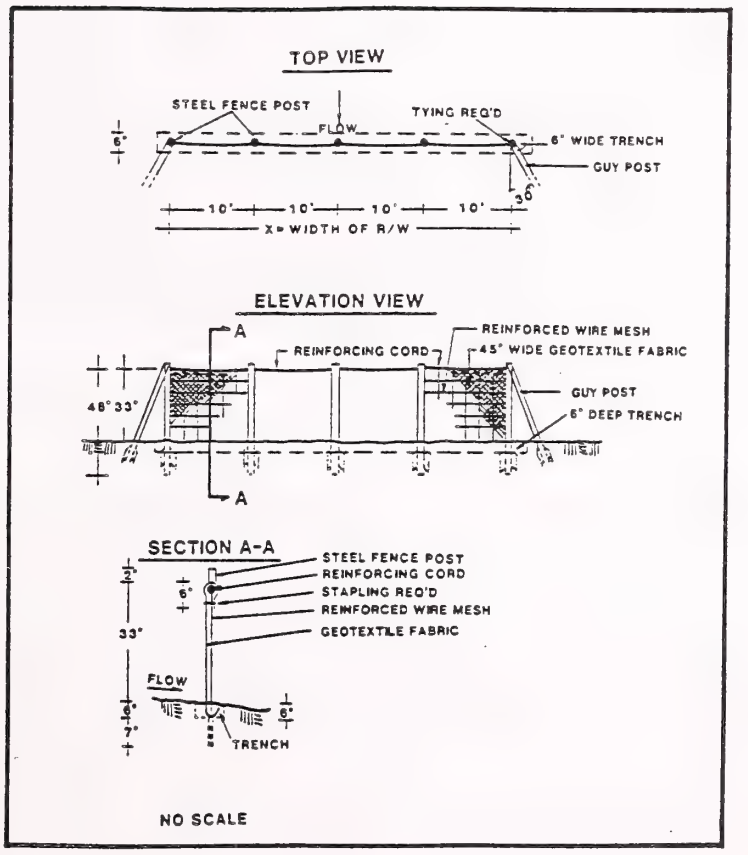


Exhibit D-1. Schematic of Waterbar and Silt Fence Construction.

Hydromulch and tackifier will be applied at a rate of 1,500 lbs/ac or as otherwise approved by the AO. Phillips may choose to hydromulch all disturbances associated with access road construction.

Fugitive Dust

If the AO determines fugitive dust generated during road construction or operation to be a problem, dust abatement procedures will be implemented. Such procedures will consist of applying water or water with additives (i.e., magnesium chloride) to the construction area at regular intervals or as approved by the AO.

New Road Construction

The following measures are designed to protect the access road and environment from excessive runoff and erosion problems that may occur during the 2- to 3-year construction, drilling, and initial reclamation period. Upon project completion, this temporary road will undergo reclamation to restore the terrain and vegetation to predisturbance conditions as described under Final Reclamation.

Right-Of-Way Clearing, Topsoil Removal, and Storage

Within the limber pine vegetation, and prior to heavy earth work with dozers and graders, the ROW will be pre-cleared of all woody vegetation greater than 2 inches in diameter. All tree stumps will be cut as low as practical, but not higher than 14 inches. All trees of commercial value (minimal and questionable) will be sold to Phillips at current market rates or as determined by the AO. Merchantable tree boles will be stacked in piles along the ROW or at other designated locations as approved by the AO. All tree stumps will be grubbed from the ROW and piled with other woody vegetation debris along the ROW for later burning or burial as specified by the AO. Within the sagebrush scrub and wetland habitat types all vegetation will be bladed from the ROW with the topsoil. Similarly, all vegetation less than 2 inches in diameter remaining in the limber pine vegetation type will be bladed with the topsoil.

Topsoil will be selectively handled as described under the Existing Access Road Reconstruction.

On slopes less than 30 percent, the topsoil will be bladed to the margins of the ROW and stockpiled along the margins of the ROW for redistribution over the disturbed areas. Topsoil will be stored separate from other earth materials to preclude contamination or mixing. On sideslopes greater than 30 percent (Alternative A), long-reach and sidecast-type of equipment such as a trackhoe will be used to salvage topsoil from cuts and fill areas. The salvaged topsoil will be transported to areas along the access road that are conducive to storage of the topsoil (i.e., flat areas).

As described in the Soils section of the EIS, large boulders ranging in size from two to over 6 feet in diameter will hamper topsoil salvage along the new road construction for Alternative B. The large boulders will require special and separate handling from the topsoil to facilitate adequate topsoil salvage. The special handling will entail utilizing an articulated bucket or scoop with an opposable appendage mounted on a trackhoe or

similar power equipment. Such an implement will allow the large boulders to be plucked from the topsoil. The boulders will require loosening with a crawler tractor to allow the boulders to be handled. The boulders will either be separately stored adjacent to the construction ROW or stored in piles at strategic locations as authorized by the AO.

Road Construction

Road construction will be accomplished following the techniques described in the Access Road Design Plans. Alternative B will require standard construction techniques. If Alternative A is permitted, benchcut and end haul construction across the 50 to 60 percent sideslope just below the drill site will be implemented to facilitate successful reclamation of this new road segment. Excavated subsoil materials will be hauled to the relatively flat areas below the steep sideslopes for storage.

Livestock Control

Livestock control for new road construction entails the same measures as described under Existing Access Road Reconstruction.

Runoff and Erosion Control

Runoff and erosion control will be accomplished as described under Existing Access Road Reconstruction. In addition to these measures, cut and fill slopes and other disturbed areas including topsoil and subsoil stockpiles will be protected from raindrop impact, surface runoff, and erosion by placing mulch or hydromulch. On slopes less than 30 percent, straw mulch will be applied by a mechanical mulch blower at a rate of 2.0 tons/ac after seeding. The mulch will be crimped into the soil surface using a serrated disc crimper, or similar implement as approved by the AO. Only certified weed free straw mulch will be used. Certification will be provided by the county extension agent of the county in which the straw was grown. Hydromulching will be used on slopes in excess of 40 percent or on slopes exceeding the operating capabilities of the machinery. Hydromulch and tackifier will be applied at a rate of 1,500 lbs/ac or as otherwise approved by the AO. Phillips may choose to use hydromulch on all disturbed surfaces.

Topsoil Respreading and Seedbed Preparation

Topsoil respreading and seedbed preparation will be accomplished as described under Existing Access Road Reconstruction.

Seed Application

Seed application will be as described previously under Existing Access Road Reconstruction.

Fertilization

See the Fertilization under Existing Access Road Reconstruction.

Mulching

Mulching will be accomplished as previously described under Existing Access Road Reconstruction.

Fugitive Dust

Fugitive dust measures for new road construction are the same as prescribed for reconstructing the existing access roads.

Drill Site

Construction of the drill site will involve clearing limber pine, sagebrush, and herbaceous vegetation, creating cut and fill to construct the drill pad, excavating the cuttings trench, and drilling the well.

Vegetation Clearing, and Topsoil Removal and Storage

Clearing vegetation and removing and storing topsoil at the drill site will be accomplished as previously described under New Road Construction. Construction of the Gold Creek Drill site (Alternative B) will entail similar special boulder handling as described above under New Road Construction. The boulders will be stored in a pile along the margins of the drill site.

Drill Site Construction

The drill pad will be constructed using standard cut and fill procedures.

Livestock and Wildlife Control

Since no livestock grazing is allowed in the project area on FS-administered land and since herbivory by wildlife is not expected to be a problem, the fence utilized to secure the drill site will not be wildlife-proof.

Runoff and Erosion Control

All surface runoff onto and off the drill site will be controlled through the use of interception ditches and berms. Interception ditches designed to carry the 50-year flood event will divert water from above the drill site, transport water to adjacent undisturbed channels, and discharge into undisturbed vegetation using armored energy dissipators similar to those described for access road construction.

A berm approximately 18 inches high will be constructed around fill portions of the drill pad to control and contain all surface runoff generated or fuel or petroleum product spills on the pad surface. A spill prevention and containment plan will be prepared by Phillips to address chemical spill issues. Water contained on the drill pad will be treated in a detention pond prior to discharge into undisturbed vegetation in the same manner as discussed previously.

EROSION CONTROL, REVEGETATION, AND REHABILITATION PLAN

Cut and fill slopes and other disturbed areas, including topsoil stockpiles, will be protected as described under New Road Construction. Erosion and sedimentation control measures and structures, such as silt fences, will be installed at the base of all fill slopes and disturbed areas. All runoff and erosion control structures will be inspected periodically, cleaned out, and maintained in functional condition throughout the duration of construction and drilling.

Topsoil Respreading and Seedbed Preparation

All topsoil disturbed at the drill site will be selectively handled and the seedbed prepared as described under Existing Access Road Reconstruction.

Seed Application

Seed will be applied to topsoiled areas at the drill site as described under Existing Access Road Reconstruction.

Fertilization

The fertilization discussion under Existing Access Road Reclamation also applies to fertilization of the drill site.

Mulching

Mulching at the drill site will be accomplished as described under Existing Access Road Reconstruction.

Fugitive Dust

See measures listed under Existing Access Road Reconstruction.

Snow Disposal

Snow will be plowed to the northeast margin of the pad, so that snowmelt will be directed into undisturbed vegetation. Snow and snowmelt should not be allowed to enter the cuttings trench if open during the winter and spring.

FINAL RECLAMATION

During final reclamation, all areas where earth work disturbed the soil will be regraded and revegetated to return the area to near predisturbance condition. The ground surface will be regraded, topsoil respread, and the site prepared for seeding and revegetation. Access road reclamation will occur after completion of drill site reclamation.

Drill Site

Cleanup and Equipment and Facilities Removal

All facilities, equipment, and debris not required for the reclamation process will be hauled off-site.

Cuttings Trench

Cuttings trench fluids will be hauled off-site to a state approved disposal site. The cuttings will be backfilled over.

Site Regrading and Topsoil Respreading

Fill material will be backfilled into cut areas in lifts and compacted to provide stability. The drill site will be regraded to approximate original topography. At least 6 inches of topsoil will be evenly distributed over the areas to be revegetated. For Alternative B, the stored boulders will be randomly replaced over the reclaimed drill site area <u>after</u> mulching to facilitate the use of power equipment to apply the mulch. After mulching has been accomplished the process of reapplying the boulders should be restricted to minimize the area of mulch disturbance.

Seedbed Preparation

If the topsoil is compacted upon respreading, a spring tooth harrow equipped with utility or seedbed teeth, or similar equipment such as a chisel plow with till 4 to 6 inches deep, or as approved by the AO, will be used to loosen and smooth the soil surface either after or in conjunction with fertilization as approved by the AO. If the topsoil is loose, it will be compacted sufficiently with a cultipacker or similar implement to provide a firm seedbed.

Seed Application

After completion of seedbed preparation, the seed mix for final reclamation presented in Table D-3, or a similar mix approved by the AO, will be applied to areas that have been topsoiled. Seed will be planted as described under Existing Access Road Reconstruction, Seed Application.

Fertilization

Fertilization will be applied as described under Construction and Drilling Phase, Drill Site.

Runoff and Erosion Control

Water bars will be constructed across the reclaimed drill site at appropriate intervals according to slope gradient. Water bars will be constructed by hand across all disturbed slopes after seeding and fertilization. The following water bar spacing guide should be used. Waterbars should be constructed across the hillslope topography of the disturbed areas at intervals described under Drilling and Construction Phase, Drill Site shown as follows:

Slope Gradient (percent)	Interval (feet)
10	150
15	100
20	50
30	40
40	35
50	30
>50	30

Waterbars should be made 12- to 18- inches deep by digging a small trench and casting the soil material to the downhill side in a row. Each waterbar should initiate in undisturbed vegetation upslope, traverse the disturbed area at a gradient between 1 and 2 percent, and discharge water into undisturbed vegetation on the lower side of the disturbed area. Exhibit D-1 presents a schematic of waterbar construction.

Mulching

All re-topsoiled and seeded areas will be protected from raindrop impact, surface runoff, and erosion by placing mulch and plastic netting over reclaimed surfaces. Certified weed-free straw mulch will be applied to the soil and crimped as described under Existing Access Road Reconstruction of the Construction and Drilling Phase. Plastic netting will be placed over the straw mulch and stapled to the ground following manufacturer's specifications at the Ruby Creek drill site to minimize the loss of mulch due to strong winds at this exposed location.

Livestock and Wildlife Control

Since no livestock grazing is allowed in the vicinity of the drill sites, no fencing to preclude livestock will be necessary. Wildlife utilization of the new vegetation is expected to be light. Annual monitoring will identify if a problem exists and appropriate remedial measures will be implemented.

Access Roads (New and Reconstructed)

Site Regrading and Topsoil Respreading

Upon completing the reclamation of the drill site and removal of all equipment, the new access road and reconstructed portions of the existing two-track roads will be reclaimed. Fill material will be backfilled into the cut area in lifts and compacted. A trackhoe or similar equipment will be required to backfill material on slopes steeper than 40 percent (i.e., Alternative A). The disturbed area will be regraded to the approximate original contour. Topsoil will be selectively handled separately from other subsoil materials. Upon regrading, topsoil will be respread to an even depth over the disturbed area. A trackhoe or similar equipment with a long-reach and side-cast capability will be required to backfill and respread topsoil on slopes greater than 40 percent (Alternative A). For Alternative B, the stored boulders will be randomly replaced over the reclaimed access road ROW **after** mulching to facilitate the use of

power equipment to apply the mulch. After mulching has been accomplished the process of reapplying the boulders should be restricted to minimize the area of mulch disturbance.

Seedbed Preparation

Seedbed preparation will occur as described above under final reclamation of the drill site. On slopes steeper than 40 percent, respread topsoil will be prepared by loosening or compacting where possible with the trackhoe.

Seed Application

After completion of seedbed preparation, the seed mixes presented in Table D-3, or D-4, or similar mixes as approved by the AO, will be applied to areas along the access road with topsoil. The seed mix in Table D-3 will be used for revegetating the upland areas (limber pine woodland and sagebrush scrub) and the seed mix in Table D-4 for the riparian areas. Seed will be planted in the fall prior to snow accumulation. Except for the riparian areas seed will be applied with drill-type equipment such as a rangeland drill or brillion seeder. Where the topography of the disturbed areas does not allow drill-type equipment such as on slopes in excess of 40 percent or in areas too small for power equipment use, seed will be broadcast applied at 2.5 times the application rate of drilled seed. A spike-toothed harrow or similar equipment will be used to cover the broadcast seed. Some areas may require covering seed by hand.

Fertilization

Fertilization should occur as described under Construction and Drilling Phase, Existing Access Road Reconstruction. Additional fertilizer applications should be made as prescribed under Final Reclamation, Drill Site.

Runoff and Erosion Control

Runoff and erosion control for final reclamation of the access roads is the same as described above for the drill site. Runoff and erosion control will consist of mulching with plastic netting, hydromulching, and crimped mulch (as discussed in the next section), as well as waterbars and other silt-type structures.

Mulching

The description of mulching under final reclamation of the drill site also applies to final reclamation mulching of the access road. Erosion and sedimentation control measures and structures such as silt fences will be constructed at the base of all disturbed areas within 100 feet of Ruby or Gold creeks or within other intermittent tributary streams.

Table D-3. Seed Mix[1] for Final Reclamation of Upland Areas.

Species	Cultivar or Variety	Seed Application Drilled Rate (PLS[2] lbs/ac)	Planting Depth (in)
Grasses:			
Mountain brome	Bromar	2.0	0.5
Western wheatgrass	Rosanna	1.5	0.5
Bluebunch wheatgrass	Secar	1.5	0.5
Idaho fescue	Joseph	1.0	0.25
Needle-and-thread	-	2.0	0.5
Sheep fescue	Covar	0.5	0.25
Forbs:			
White Sweetclover	-	0.5	0.25
Lewis flax	-	0.5	0.25
Rocky Mountain penstemon	-	0.5	0.25
White yarrow	-	0.5	0.25
Shrubs:			
Bitterbrush	-	2.0	0.5
Black sagebrush	-	0.5	0.25
Fringed sagebrush	-	0.5	0.25
Mountain big sagebrush	-	0.5	0.25
		15.0	

	Suggested Alternate Species[3]	Replaces
Grasses:	Hard fescue	Sheep fescue
	Slender wheatgrass	Bluebunch wheatgrass
	Columbia needlegrass	Needle-and-thread
	Indian ricegrass	Idaho fescue
	Salina wildrye	Mountain brome
Forbs:	Sainfoin	White sweetclover
	Scarlet globemallow	Lewis flax
Shrubs:	Prairie sage	Fringed sagebrush
	Wyoming big sagebrush	Mountain big sagebrush
	Rubber rabbitbrush	Black sagebrush

1- Seed mix based on objectives previously listed: adaptation to project site conditions, usefulness for site stabilization, livestock and wildlife use, species success in revegetation efforts, and current seed availability and cost. Seed mixes have been developed with suggestions from the USDA Bridger Plant materials Center, Bridger, MT.

2- PLS = pure live seed. If broadcasted, rates should be increased by a factor of 2.5.

3- Replacement species if suggested species are not available (substitution, if necessary, will be directed by the Authorized Officer). Coordinate with the USDA Bridger Plant Materials Center for replacements.

Table D-4. Seed Mix[1] for Final Reclamation of Riparian Areas.

Species[2]	Cultivar or Variety	Seed Application Broadcast Rate (PLS[3] lbs/ac)
Grasses:		
Tufted Hairgrass	-	4.0
Timothy	-	4.0
Redtop bentgrass	-	4.0
Meadow foxtail	-	6.0
Forbs:		
White Dutch clover	-	2.0
Alsike clover	-	2.0
Wild geranium	-	3.0
Shrubs:		
Golden currant	-	1.0
Shrubby cinquefoil	-	3.0
		29.0

1- Seed mix based on objectives previously listed: adaptation to project site conditions, usefulness for site stabilization, species success in revegetation efforts, livestock and wildlife use, and current seed availability and cost. Seed mixes have been developed with suggestions from the USDA Bridger Plant Materials Center, Bridger, MT.

2- If a species is not available, then increase seed application rate proportionately for each available species.

3- PLS = pure live seed

MONITORING AND MAINTENANCE

All measures to control erosion, sedimentation, and vehicle access to the disturbed areas will be kept in effective and functional condition at all times until the AO determines that reclamation objectives, as previously listed, have been met as measured against performance standards or criteria. A designated official of Phillips and the AO will visit the site a minimum of once per year (July) to inspect and review the condition of the reclaimed areas, assess the success and prognosis of runoff and erosion control measures, and quantitatively evaluate the revegetation effort. The following specific items will be noted qualitatively and recorded during inspection(s):

- soil slumping
- stream siltation
- noxious weed invasion
- degree of herbivory by rodents or lagomorphs on seed or seedlings
- revegetation success
- degree of grazing or trampling on revegetated areas
- channel erosion
- sheet and rill erosion
- soundness and effectiveness of erosion control structures
- soundness and effectiveness of OHV control structures and locations of additional unauthorized OHV access.

Monitoring Procedures

The following monitoring procedures will be utilized during the monitoring procedures.

Establishment of Baseline Conditions

Baseline data was obtained from 100-foot reference transects established during the field review of both Alternative A and B drill sites in October 1988. The same parameters, with the exception of seedling establishment, were measured along these transects as will be measured along the monitoring transects described under **Revegetation Evaluation** and **Erosion Evaluation**. Measurements taken along the reference transects are included in Appendices D-1 and D-2.

Monitoring Transects

Monitoring will be accomplished along 100-foot transects placed at strategic locations in the reclaimed areas. Two transects will be placed on the reclaimed drill sites and additional transects along the access road. These transects, like the reference transect, will be permanently located with monuments (e.g., stakes or re-bar). **Revegetation Evaluation** and **Erosion Evaluation** sections discuss the parameters that will be measured along the transects.

Photomonitoring

Photos of each transect will be taken annually, one photo showing the overall character of the transect and another photo showing the detail of the conditions along the transect. Photos will be taken at this point annually with each photo framing the same landscape from year to year.

Revegetation Evaluation

Quantitative revegetation evaluation will be accomplished annually in July. Procedures will follow the monitoring guidelines presented in Appendix D-1. Parameters to be measured include percent cover (plant, litter, rock, bare ground, total), dominant species and percent composition, seedling density and abundance, and grazing utilization as indicated on Form II of the guidelines. Appendix D-2 presents this data for the reference transect.

Erosion Evaluation

The condition of the soil surface relative to erosion and erosion protection will be observed annually during the monitoring process at the well site as well as once early during the monitoring process along the reference transect to establish baseline conditions. The parameters listed on Form II will be evaluated to arrive at a erosion condition class and soil surface factor. Appendix D-2 presents the baseline data for the reference transect.

Performance Standards

The results of monitoring will be compared to the performance standards listed previously.

Results and Reporting

An annual report describing the quantitative and qualitative findings of the semi-annual inspections, photographs taken at each photomonitoring point, prognosis of the reclamation effort, and discussion and results of any remedial measures approved by the AO during the year will be prepared and submitted before October 15 of each year to the AO. Should monitoring of site conditions identify areas of concern, Phillips will incorporate within the annual report what measures will be taken to mitigate the problem(s). If pesticides or herbicides are required, Phillips will prepare and submit a control plan consistent with existing management objectives and standards to the AO

for approval prior to use. All disturbed areas will be monitored for reclamation success and noxious weeds until released by the AO upon attainment of the Performance Standards presented earlier in this plan.

APPENDIX D

REFERENCES CITED

Grah, O.J., and J. Crane. 1989. Vegetation, Timber and Range Resources Technical Report. Prepared for Phillips' Ruby A Federal No. 1-9 Exploratory Oil Well Project. Logan, Utah.

APPENDIX D-1 - MONITORING METHODS

APPENDIX D

MONITORING METHODS

Introduction

The following methods should be implemented for successful accomplishment of monitoring and to ensure adequate attainment of performance standards. The general approach involves observing and taking measurements of predisturbance condition at regular intervals during the reclamation process (i.e., annually) and comparing the information. Generally, these methods should be implemented in July at the time of vegetative maturity (i.e., seed set).

Form I

Form I provides a summary of the baseline or predisturbance condition of the area to be reclaimed and additional reclamation information. This information will primarily be obtained from following the same procedures described in the following sections. Predisturbance or reference vegetation information will be compiled from reference transects.

Form II - 100-Foot Transect

Percent Vegetal Cover. Percent vegetal cover is determined by examination of 100 points along a 100-foot transect. Observation consists of recording the total number of "hits" for plant, litter, rock, or bare ground. When a plant is recorded, the species is also noted. Each point noted, corresponds to every foot increment on the 100-foot tape.

Dominant Species. Dominant species is determined by identifying the species with the highest frequency.

Seedling Density and Relative Abundance. Total number of plants is counted in one foot intervals at the 20-, 40-, 60-, and 80-foot points along the transect. At these points perennial seedlings per lineal foot of transect or the drill row (or in the case of broadcast seeding seedlings per lineal foot of transect) are recorded and averaged. Ratings are based on the following evaluation system.

Plants per Lineal Foot	Rating
8+	Excellent
5-7	Good
3-4	Fair
0-2	Poor

Table D-1-1. Range Utilization Rating Descriptions.

Utilization Range	Rating	General Description
1-40%	Light	The revegetation may be topped, skimmed or grazed in patches, 60-80% of the number of current seed stalks remain intact. Most young plants are undamaged. Little or no use of non-palatable species.
44-60%	Moderate	The revegetation appears entirely covered (grazed) as uniformly as natural features and facilities will allow. 15-25% of the number of current seed stalks remain intact. No more than 10% of the non-palatable species are utilized.
61-100%	Heavy	The revegetation has the appearance of complete and repeated grazing use. Less than 10% of the current seed stalks are remaining. The remaining stubble of preferred grasses may be grazed to the soil surface.

Grazing Impacts. Grazing impacts are assessed as an ocular estimate of the percent utilization along the cover transect recorded at 10-foot intervals. Utilization of revegetation efforts is based on the removal of "seeded" grasses (i.e., current year's growth) by grazing. The amount of utilization is expressed in percent of above ground biomass which is grazed. Table D-1-1 presents a general description for the range utilization ratings.

Erosion Condition Class/Soil Surface Factor. This method numerically rates soil movement, surface litter, surface rock, pedestalling, flow patterns and rill/gully formation and translates these physical factors into an evaluation of the vegetation and erosion stability of an area. Results are an expression of current erosion activity, and can be used to reflect revegetation success as a function of site stability.

To use this form, identify the numerical factor that most nearly describes the current erosion condition by circling the factors on Form III.

Evaluate each erosional feature if water erosion is the most prevalent type of erosion. (Omit surface rock if not present).

If wind erosion is most prevalent, do not include the rill and gully features in the computation.

Table D-1-2. Erosion Condition Class and Soil Surface Factor

Erosion Condition Class	Soil Surface Factor Ranges
Stable	1 - 20
Slight	21 - 40
Moderate	41 - 60
Critical	61 - 80
Severe	81 -100

FORMS

APPENDIX D

FORM I

Reclamation and Erosion Monitoring; Background Data

A. Revegetation Project Name: _____ Company: _____

Data collected by: _____ Telephone No: _____

(Company/Agency Representative)

Monitoring Site Number: _____

B. Legal Location

Twp. _____
Rng. _____
Sec. _____
Sub. _____

C. Slope % _____

Aspect _____
Elevation _____
(include construction map with transect site marked)

D. Key species in Reference Vegetation

_____ - _____ %
_____ - _____ %
_____ - _____ %
_____ - _____ %
_____ - _____ %
_____ - _____ %

E. Soil: Texture - Rock Content

0-6" _____ - _____ %
_____ - _____ %

Include 35 mm photograph of Reference Plot) Site should be marked on reference map.

F. Disturbance Description: Date _____

G. Revegetation Objectives: _____

H. Criteria for Determining Success: _____

I. Reclamation Treatment Record - Date or season applied: _____

1. Topsoiling: _____
2. Erosion Control: _____
3. Soil Amendments: _____

4. Seed Mix (lbs/acres): _____

_____

5. Mulch Type: _____

6. Mechanical treatments: _____

_____

7. Remarks: _____

_____

Attach photo record of transect and Reference plot with dates.

APPENDIX D

FORM II

Revegetation and Erosion Monitoring Evaluation

A. Project Name: _____ Company: _____

Date Collected by: _____ Telephone No: _____
(Company/Agency Representative)

Monitoring Site Number: _____ Date: _____

B. Revegetation Evaluation:

1. % Cover
_____ % Plant
_____ % Litter
_____ % Rock
_____ % Bare Ground
_____ % Total

2. Dominant Species %
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____

3. Seedling Density & Abundance
_____: Average plants per linear ft.
(Drill row/transect)
_____: Rating

4. Grazing Impact (Util.)
_____: Utilization
_____: Rating

FORM III
Erosion Evaluation

Evaluate conditions 50 feet on either side of transect line. Assign a numerical rating for each category.

SURFACE LITTER	No movement, or if present, less than 2 percent of the litter has been translocated and redeposited against obstacles. 0 or 3	Between 2 and 10 percent of the litter has been translocated and redeposited against obstacles. 6	Between 10 and 25 percent of the litter has been translocated and redeposited against obstacles. 8	Between 25 and 50 percent of the litter has been translocated and redeposited against obstacles. 11	More than 50 percent of the litter has been translocated and redeposited against obstacles. 14
SURFACE ROCK MOVEMENT	No movement, or if present, less than 2 percent of the surface rock fragments have been translocated and/or redeposited against obstacles and show an even distribution on the landscape. 0 or 2	Between 2 and 10 percent of the surface rock fragments have been translocated and/or redeposited against obstacles and begun to show localized concentration. 5	Between 10 and 25 percent of the surface rock fragments have been translocated, redeposited against obstacles, and show localized concentration. 8	Between 25 and 50 percent of the surface rock fragments have been translocated, redeposited against obstacles, and show localized concentration. 11	More than 50 percent of the surface rock fragments have been translocated, deposited against obstacles, and show extreme localized concentration. 14
PEDESTALLING	Pedestals are mostly less than .1 in. (25 mm) high, and/or less frequent than 2 pedestals per 100 sq. ft. 0 or 3	Pedestals are mostly between .1 to .3 in. (2.5 to 8 mm) high, and/or have a frequency of 2 to 5 pedestals per 100 sq. ft. 6	Pedestals are mostly between .3 and .6 in. (8 to 15 mm) high, and/or have a frequency of 5 to 7 pedestals per 100 sq. ft. 9	Pedestals are mostly between .6 to 1 in. (15 to 25 mm) high, and/or have a frequency of 7 to 10 pedestals per 100 sq. ft. 11	Pedestals are mostly over 1 in. (25 mm) high, and/or have a frequency of over 10 pedestals per 100 sq. ft. 14
FLOW PATTERNS	None, or if present, less than 2 percent of the surface area shows evidence of recent translocation and deposition of soil and litter. 0 or 3	Between 2 and 10 percent of the surface area shows evidence of recent translocation and deposition of soil and litter. 6	Between 10 and 25 percent of the surface area shows evidence of recent translocation and deposition of soil and litter. 9	Between 25 and 50 percent of the surface area shows evidence of recent translocation and deposition of soil and litter. 12	Over 50 percent of the surface area shows evidence of recent translocation and deposition of soil and litter. 15
RILLS	Rills, if present, are mostly less than .5 in. (13 mm) deep, and generally at infrequent intervals over 10 ft. 0 or 3	Rills are mostly .5 to 1 in. (13 to 25 mm) deep, and generally at infrequent intervals over 10 ft. 6	Rills are mostly 1 to 1.5 in. (25 to 38 mm) deep, and generally at 10 ft. intervals. 9	Rills are mostly 1.5 to 3 in. (38 to 76 mm) deep, and at intervals of 5 to 10 ft. 12	Rills are mostly 3 to 6 in. (76 to 152 mm) deep, and at intervals of less than 5 ft. 14
GULLIES	No gullies, or if present, less than 2 percent of the channel bed and walls show active erosion (are not vegetated), gullies make up less than 2 percent of the total area. 0 or 3	Between 2 and 5 percent of the channel bed and walls show active erosion (are not vegetated), or gullies make up between 2 and 5 percent of the total area. 6	Between 5 and 10 percent of the channel bed and walls show active erosion (are not vegetated), or gullies make up between 5 and 10 percent of the total area. 9	Between 10 to 50 percent of the channel bed and walls show active erosion (are not vegetated), or gullies make up between 10 to 50 percent of the total area. 12	Over 50 percent of the channel bed and walls show active erosion (are not vegetated) along their length, or gullies make up over 50 percent of the total area. 15
SOIL MOVEMENT	Depth of recent deposits around obstacles, or in microterraces; and/or depth of truncated areas, is between 0 and 1 in. (0 to 25 mm). 0 or 3	Depth of recent deposits around obstacles, or in microterraces; and/or depth of truncated areas, is between 1 and 2 in. (2.5 to 5 cm). 5	Depth of recent deposits around obstacles, or in microterraces; and/or depth of truncated areas, is between 2 and 4 in. (5 to 10 cm). 8	Depth of recent deposits around obstacles, or in microterraces; and/or depth of truncated areas, is between 4 and 8 in. (10 to 20 cm). 11	Depth of recent deposits around obstacles, or in microterraces; and/or depth of truncated areas, is over 8 in. (20 cm). 14

* Total numerical ratings and divide by total possible = soil surface factor.

_____ Erosion Condition Class _____ Soil Surface Factor

APPENDIX D

APPENDIX D-2 - REFERENCE TRANSECT DATA

Table D-2-1. Raw Point Intercept Data for the Alternative A (Ruby Creek) Drill Site.

Transect 1

1	KOPY	26	LITTER	51	LITTER	76	ASMI
2	FEOV	27	MOSS	52	FEOV	77	FEOV
3	CHRYS	28	ROCK	53	FEOV	78	FEOV
4	CHRYS	29	FEOV	54	ASMI	79	ASMI
5	BARE	30	ASMI	55	MOSS	80	ROCK
6	CYMOP	31	LITTER	56	ROCK	81	LITTER
7	FEOV	32	LITTER	57	KOPY	82	ARFR
8	ARTR	33	FEOV	58	ROCK	83	LUPINE
9	FEOV	34	ASGP	59	AGSP	84	LITTER
10	ROCK	35	LITTER	60	LITTER	85	ARFR
11	FEOV	36	FEOV	61	FEOV	86	MOSS
12	FEOV	37	MOSS	62	ROCK	87	FEOV
13	STIPA	38	ARTR	63	BARE	88	BARE
14	MOSS	39	ERIG	64	LITTER	89	LITTER
15	MOSS	40	MOSS	65	FEOV	90	FEOV
16	BARE	41	FEOV	66	AGSP	91	LUPINE
17	MOSS	42	PHLOX	67	LITTER	92	FEOV
18	BARE	43	ERIG	68	POTEN	93	MOSS
19	FEOV	44	MOSS	69	LITTER	94	KOPY
20	ERIG	45	KOPY	70	MOSS	95	ERIG
21	AGSP	46	FEOV	71	FEOV	96	FEOV
22	ASMI	47	ARFR	72	AGSP	97	FEOV
23	FEOV	48	ERIG	73	LITTER	98	FEOV
24	CYMOP	49	MOSS	74	MOSS	99	LITTER
25	FEOV	50	KOPY	75	ARFR	100	AGSP

Transect 2

1	ARTR	26	ARTR	51	ARTR	76	FEID
2	POA	27	ARTR	52	ARTR	77	ARTR
3	ARTR	28	ARTR	53	POA	78	ARTR
4	FEID	29	ARTR	54	JUCO	79	ARTR
5	FEID	30	POA	55	JUCO	80	ARTR
6	FEOV	31	POA	56	JUCO	81	ARTR
7	ARTR	32	KOPY	57	ARTR	82	ARTR
8	ARTR	33	POA	58	ARTR	83	LITTER
9	ARTR	34	FEID	59	ARTR	84	ARTR
10	ARTR	35	FEOV	60	ARTR	85	ARTR
11	ARTR	36	ARTR	61	ARTR	86	LITTER
12	ARTR	37	POA	62	FEOV	87	FEOV
13	ARTR	38	ARTR	63	KOPY	88	FEOV
14	ARTR	39	ACMI	64	ARTR	89	ARTR
15	ARTR	40	FEID	65	ARTR	90	ARTR
16	FEID	41	LITTER	66	ARTR	91	ARTR
17	ARTR	42	FEOVX	67	ASMI	92	ARTR
18	ACMI	43	ARTR	68	FEOV	93	LITTER
19	LITTER	44	ARTR	69	LITTER	94	FEOV
20	LITTER	45	ARTR	70	LITTER	95	ASMI
21	ARTR	46	ARTR	71	MOSS	96	LITTER
22	ARTR	47	FEOV	72	FEOV	97	LITTER
23	ARTR	48	ARTR	73	ERIG	98	AGSP
24	ARTR	49	LUPINE	74	AGSP	99	ARTR
25	ARTR	50	ARTR	75	FEOV	100	ARTR

APPENDIX D

Table D-2-2. Raw Point Intercept Data for the Alternative B (Gold Creek) Drill Site.

Transect 1

1	ROCK	26	ARTR	51	ROCK	76	ARTR
2	ARTR	27	ARTR	52	FEOV	77	ROCK
3	ELCA	28	LUPINE	53	LITTER	78	ROCK
4	ELCA	29	ANTEN	54	ARTR	79	REOV
5	PSME	30	ASMI	55	ARTR	80	CAGE
6	ARTR	31	FEOV	56	ARTR	81	BARE
7	ARTR	32	ARTR	57	ARTR	82	AGSP
8	PHAL	33	AGSP	58	ARTR	83	ARTR
9	ELCA	34	LITTER	59	ARTR	84	JUHO
10	LITTER	35	ROCK	60	ARTR	85	JUHO
11	ELCA	36	FEOV	61	ARTR	86	JUHO
12	STIPA	37	FEOV	62	FEID	87	CAGE
13	LITTER	38	ARTR	63	FEID	88	FEOV
14	FEOV	39	PSME	64	GALIUM	89	FEID
15	FEOV	40	PSME	65	ROCK	90	LITTER
16	FEOV	41	ARTR	66	ROCK	91	ROCK
17	ARTR	42	ROCK	67	AGSP	92	ROCK
18	ARTR	43	ARTR	68	LITTER	93	ARTR
19	ARTR	44	ARTR	69	ROCK	94	BARE
20	LITTER	45	ARTR	70	ARTR	95	JUHO
21	ARTR	46	ARTR	71	ARTR	96	JUHO
22	ACMI	47	MOSS	72	LITTER	97	ARTR
23	LITTER	48	ROCK	73	FEOV	98	ARTR
24	FEOV	49	ARTR	74	CAGE	99	ARTR
25	FEOV	50	KOPY	75	AGSP	100	FEOV

Transect 2

1	ROCK	26	ARTR	51	AGSP	76	ARTR
2	ARTR	27	ARTR	52	STIPA	77	FEOV
3	ARTR	28	ARTR	53	LITTER	78	ERIG
4	ARTR	29	ARTR	54	KOPY	79	ARTR
5	STIPA	30	FEOV	55	FEOV	80	AGSP
6	ROCK	31	FEOV	56	LITTER	81	ROCK
7	ROCK	32	FEOV	57	KOPY	82	ROCK
8	AGSP	33	LUPINE	58	ARTR	83	ROCK
9	LITTER	34	ARTR	59	LITTER	84	LITTER
10	ARTR	35	ARTR	60	FEOV	85	ARTR
11	ARTR	36	ROCK	61	LUPINE	86	ARTR
12	ASMI	37	ARTR	62	ARTR	87	LITTER
13	FEID	38	ARTR	63	ARTR	88	LITTER
14	BARE	39	ARTR	64	KOPY	89	KOPY
15	FEOV	40	ARTR	65	ASMI	90	AGSP
16	ARTR	41	ARTR	66	ARTR	91	CAGE
17	ARTR	42	FEOV	67	ROCK	92	ARTR
18	ARTR	43	ARTR	68	ROCK	93	ARTR
19	MOSS	44	ARTR	69	PSME	94	ARTR
20	AGSP	45	ROCK	70	ARTR	95	ARTR
21	ARTR	46	FEID	71	ARTR	96	ARTR
22	ARTR	47	LITTER	72	LITTER	97	ELCA
23	FEOV	48	LUPINE	73	ARTR	98	ARTR
24	CAGE	49	LITTER	74	LITTER	99	ARTR
25	LITTER	50	ARTR	75	FEOV	100	LITTER

APPENDIX E

Contingency and Evacuation Plan

APPENDIX E

Contingency and Evacuation Plan

CONTINGENCY & EVACUATION PLAN

This Contingency Plan is for

PHILLIPS PETROLEUM COMPANY

152 North Durbin Street, Second Floor

Casper, Wyoming 82601

(307) 237-5969

This Plan is for the accidental release of H_2S during the drilling of

RUBY A FEDERAL NO. 1-9

Bottom Hole Location: Section 9: T9S R20E
Carbon County, Montana

Surface Location: NW/NW Section 15: T9S R20E
Carbon County, Montana

This Plan is subject to updating

August 1, 1988

CONTINGENCY PLAN INDEX

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APPENDIX E

CONTINGENCY & EVACUATION PLAN

PHILLIPS PETROLEUM COMPANY
152 North Durbin Street, Second Floor
Casper, Wyoming 82601
(307) 237-5969

RUBY A FEDERAL NO. 1-9
Section 9: T9S R20E
Carbon County, Montana

DIRECTIONS TO LOCATION:

From Cody, Wyoming, proceed north on Wyoming Highway 120 approximately 41.5 miles to Meeteetse Trail road. Turn left (west) onto Meeteetse Trail Road and proceed approximately 2.5 miles. Turn right (north) and proceed 1.0 miles, then west for 3 miles to Forest Service boundary and continue 0.8 miles to location.

I. PURPOSE

The purpose of this plan is to safeguard the lives of the public, contract personnel and company personnel in the event of equipment failures or disaster during drilling or completion operations in formations that may contain hydrogen sulfide (H_2S) gas.

Phillips Petroleum Company has specified materials and practices for the drilling or completion of this well to ensure the safety of all concerned. However, as a precautionary measure, this contingency and evacuation plan has been prepared to further assure the safety of all concerned should a disaster occur.

II. DESCRIPTION OF HYDROGEN SULFIDE GAS

H_2S is a colorless gas that smells similar to rotten eggs in low concentrations. In high concentrations or long periods of exposure, the sense of smell may be paralyzed. H_2S is an extremely toxic gas that must be treated with extreme care to prevent injury to people.

H_2S is heavier than air (specific gravity = 1.19) and on still days tends to accumulate in low places. This accumulation could build up and lead to dangerous concentrations. However, if the H_2S gas is warmer than air, it will tend to rise until cooled off and could affect workers above the escaping source.

The toxicity of H_2S gas is as follows:

APPENDIX E

PERIODS OF EXPOSURE	PARTS OF H_2S GAS (PPM)
Prolonged exposure - no adverse effects	10 ppm
Over 1 hour could be hazardous	150 ppm
Possibly fatal in less than 1/2 hour	300 ppm
Fatal in a few hours	700 ppm

III. TREATMENT OF HYDROGEN SULFIDE POISONING

A. Remove the victim to fresh air; call physician or ambulance if possible.

B. If breathing is labored or has ceased, give artificial respiration immediately. Continue until physician is available, even if person appears not to be breathing. Should disaster conditions make it impossible to remove to fresh air, keep your mask on and use resuscitator on victim.

C. If giving artificial respiration and victim is breathing, use resuscitator to help eliminate H_2S from the blood stream.

D. Keep victim at rest and prevent chilling.

E. Get victim to a physician as soon as possible.

IV. METALLURGICAL CONSIDERATIONS

A. Steel drill pipe used in hydrogen sulfide environments should have a yield strength of 95,000 psi or less because of potential embrittlement problems. Drill stem joints near the top of the drill string are normally under the highest stress levels during drilling and do not have the protection of elevated downhole temperatures. These factors should be considered in design of the drill string. Precautions should be taken to minimize drill string stress caused by conditions such as excessive dogleg severity, improper torque, whip, abrasive wear on tool joints and joint imbalance. American Petroleum Institute, Bulletin RP 7G, will be used as a guideline for drill string precautions.

B. Corrosion inhibitors may be applied to the drill pipe or to the mud system as an additional safeguard.

C. Blowout preventers should meet or exceed the recommendations for hydrogen sulfide service as set forth in the latest edition of API RP 53.

V. BLOWOUT PREVENTION MEASURES DURING DRILLING

A. Blowout preventer (BOP) requirements:
All BOP equipment shall meet Phillips Petroleum Company's specifications as to materials acceptable for H_2S service. This equipment will be tested to full working pressure on initial installation and routinely

will be tested to full working pressure on initial installation and routinely thereafter, not to exceed two week periods and at any time a seal has been broken, a leak experienced or a known H_2S bearing formation is to be drilled.

B. Drill string requirements:
All drill string components are to be of material that meets Phillips Petroleum Company's specifications for H_2S service. Corrosion will be monitored by coupons to protect drill string.

C. Gas monitoring equipment:

1. A continuous H_2S monitoring system with three or more H_2S detection heads will be in operation, one sampling from the shale shaker, one sampling from the bell nipple below the rotary table and one sampling at the rig floor. All units should be monitored in the mud logger's trailer and/or the dog house.

   Each unit will be set to trigger a flashing light on the rig floor should the amount of H_2S reach 10 ppm and to trigger the alarm should the amount of H_2S reach 20 ppm. Any time it is necessary to deactivate the alarm (if H_2S is continuously present), a trained operator or H_2S supervisor will monitor the H_2S detection system.

2. When approaching or completing H_2S formations, crew members may attach 8-hour H_2S electronic personnel monitors to their person, if warranted.

3. Hand held H_2S sampling gas detectors will be used to check areas not covered by automatic monitoring equipment.

4. The Phillips "E&P Drilling Manual - Well Control" shall be used as a reference.

D. Crew Training & Protection:

1. Well Control Drills

   Pit level and well kill drill training will be held with each crew until proficient in closing the well in. Drills will be held on a regular basis thereafter, with at least one drill per crew each week. Drills are to be on a surprise basis. Reaction time will be checked from the time the alarm goes off until well is simulated closed in. A copy of Phillips Petroleum Company's Pit Level & Well Kill Drill Report will be posted on the rig floor.

2. H_2S Training and Drills:

   H_2S safety training will be given to all personnel, including the correct fit and use of the masks, resuscitator and artificial respiration. Beards, heavy side burns or other facial hair that prevents proper sealing of the face masks are prohibited. H_2S drills

will be held on a surprise basis during drilling (or completion) and tripping operations. The drilling supervisor or tool pusher will trigger the H_2S alarm.

H_2S Drill

When H_2S alarm is activated:

a. Drilling crew will mask up.
b. Raise tool joint above rotary table and shut down pump. Observe well.
c. Close-in BOP.
d. Go to Safe Briefing Area.

3. Safety equipment:
As outlined in (Appendix I) H_2S safety protection equipment will be available to/or assigned each person on location and training given in correct usage.

E. Fluid Control

The mud additives and scavengers equivalent to 2 pounds per barrel of treatment for total circulating mud volume which will treat 800 to 1000 ppm H_2S in mud system will be provided on location at all times. Swabbing or drill stem testing fluids containing H_2S will be through a separator to permit flaring of gas. Flares will have a continuous pilot light to insure ignition of all such gas.

VI. CONTINGENCY PROCEDURES

A. Responsibility:

In order to assure the proper execution of this plan, it is essential that one person be responsible for and in complete charge of implementing these procedures. The responsibility will be as follows:

1. The Phillips Petroleum Company's representative or his assistant.
2. Contract Tool Pusher (should the Phillips Petroleum Company man become disabled).
3. Driller on tour.

B. General Equipment:

1. Two areas on location will be designated as BRIEFING AREAS. The one that is upwind from the wellbore will be designated the "SAFE BRIEFING AREA." The "SAFE BRIEFING AREA" will be recognizable by the position of the "SAFETY" trailer in this area (See Appendix IV).

2. In the case of an emergency, personnel will assemble in the "SAFE BRIEFING AREA" as per prior instructions from Phillips Petroleum Company's representative.

3. The H_2S "SAFETY" trailer provided by the H_2S Safety Company will contain the equipment listed in Appendix I and will have a wind sock or streamer to indicate wind direction.

4. A second wind sock or streamer will be located at the end of the catwalk and visible from the rig floor.

5. A condition warning sign will be displayed on location and at the location entrance, of current operation conditions.

6. A list of emergency telephone numbers will be kept on the rig floor, contract tool pusher's trailer, Phillips Petroleum Company's trailer and in "SAFETY" trailer.

7. Two barricades will be available to block entrance to location should an emergency occur.

8. An undulating high and low pitch siren will be installed.

C. Emergency procedures and definition of warning signs:

CONDITION: <u>GREEN - NORMAL OPERATIONS</u>

CONDITION: <u>YELLOW - POTENTIAL DANGER - A CAUTION</u>

Cause for Condition:

1. Circulation
2. Trip gas after trips
3. Circulating out gas on chokes
4. Poisonous gas present, but below threshold concentrations
5. Coring and core barrel is being pulled out of well
6. Drill stem test is to be performed or DST tools are being pulled out of well

Safety Action:

1. Check safety equipment and keep it with you
2. Be alert for a change in condition warning sign
3. Follow instructions

CONDITION: <u>RED - EXTREME DANGER</u>

Cause for Condition:

Uncontrolled flow from well with lethal concentrations of H_2S

Safety Action:

1. Stay in "SAFE BRIEFING AREA" unless instructed to do otherwise

2. DO NOT PANIC

3. The decision to ignite should be made only as a last resort and it is clear that:

   a. Human life is endangered, and

   b. There is no hope of controlling the well under prevailing conditions. Every effort should be made to notify Phillips Petroleum Company's office if time permits.

4. Order evacuation of local people within the danger zone, request help from local authorities (State Police & Sheriff's Department) to evacuate people and to control traffic.

5. Notify Phillips Petroleum Company's office of well condition.

D. Evacuation Procedures:

1. The Phillips Petroleum Company's representative (or next man-in-charge) will set off the siren and notify the appropriate agencies and law officers that an emergency exists and help is needed.

2. Summer residents will be provided with radio alarm or some means of emergency communication in the event of H_2S danger. Residents would be evacuated (if needed) by Drilling personnel during well site evacuation.

   Residents will be briefed on evacuation procedures prior to commencement of drilling operations.

3. The Phillips Petroleum Company representative (or next man-in-charge) will meet with appropriate agencies and law officers as soon as practical to brief them on the situation and coordinate evacuation efforts.

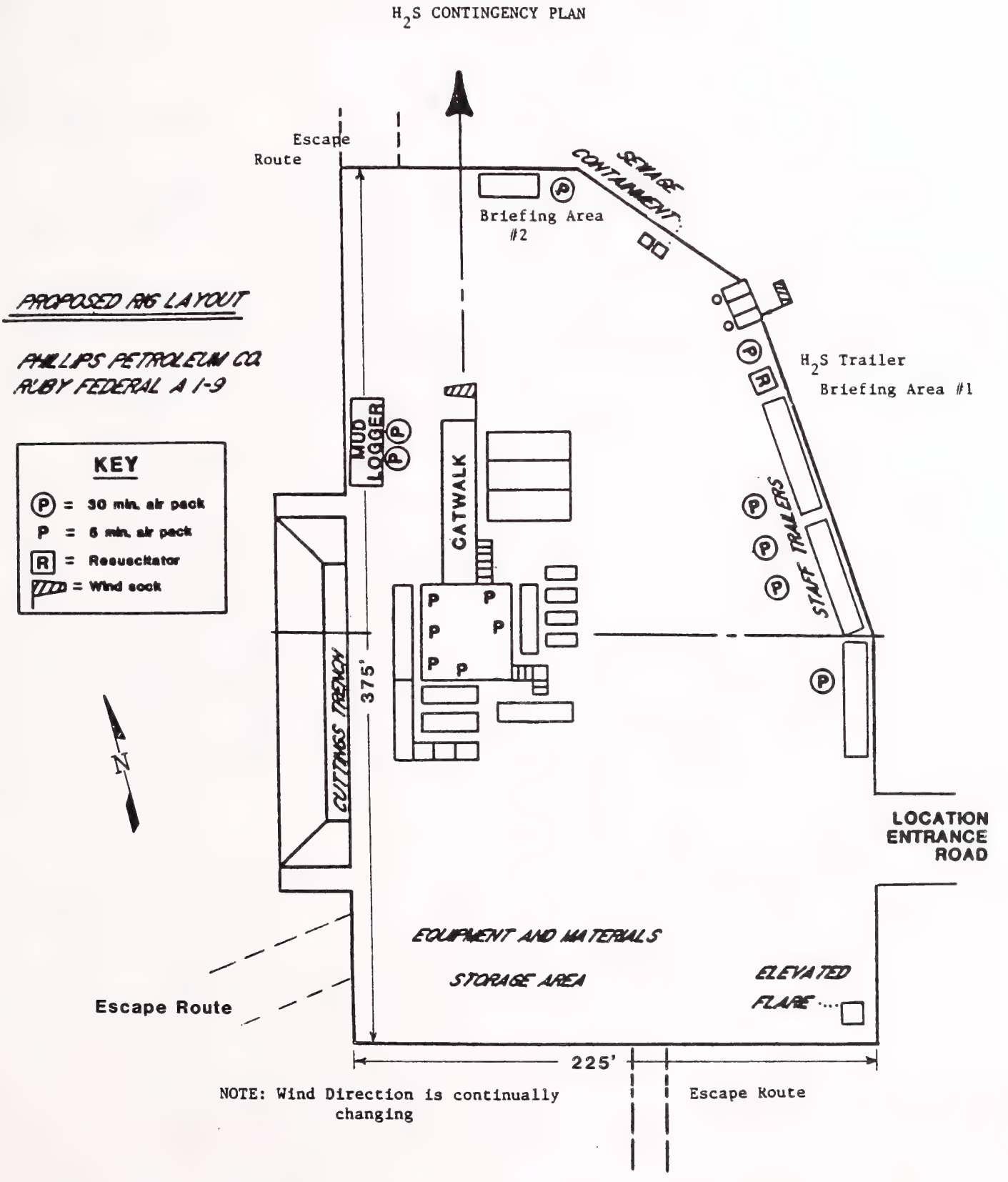

Exhibit E-1. Location of Contingency and Evacuation Plan Components.

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APPENDIX I - SAFETY EQUIPMENT

Hydrogen Sulfide Respiratory Drill Site Unit

Number Available

1	Safety trailer with a cascade system of 10 to 300 cu.ft. bottles compressed breathing air complete with high pressure manifolds or air compressor
5	Emergency Escape Units
5	45 cu.ft. self-contained breathing apparatus (SCOTT)
6	Airline breathing apparatus complete with 7 cu.ft. egress cylinders
1	Resuscitator or inhalator
1	H_2S pump type gas detector
10	1/4" breathing air hose with quick connects
2	Low pressure manifolds (5-man)
3	Wind socks
1	Fire Extinguisher
1	High pressure compressed air refill hose
1	Flare gun with cartridges
1	Stretcher
1	First Aid Kit
2	Poison gas sign
1	4' x 4' condition code warning signs with warning flags
1	Briefing area signs
1	Eyewash station
1	Three-channel continuous H_2S monitor w/ sensing heads and cables
1	Siren - Explosion Proof
1	Warning Light - Explosion Proof
1	Briefing area stand

Hydrogen Sulfide Respiratory Drill Site Unit, Continued

Number Available	
2	300 cu.ft. bottles with pigtail and tee

NOTE: Also know, equipment will be supplied to satisfy the number of people on location at any one time.

MAXIMUM NUMBER OF PEOPLE 15 AT ANY ONE TIME.

APPENDIX II

LIST OF RESIDENTS WITHIN A 2-MILE RADIUS

Frisby - Seasonal Residents - No Telephone

NW1/4 Section 14-T9S-R20E

APPENDIX E

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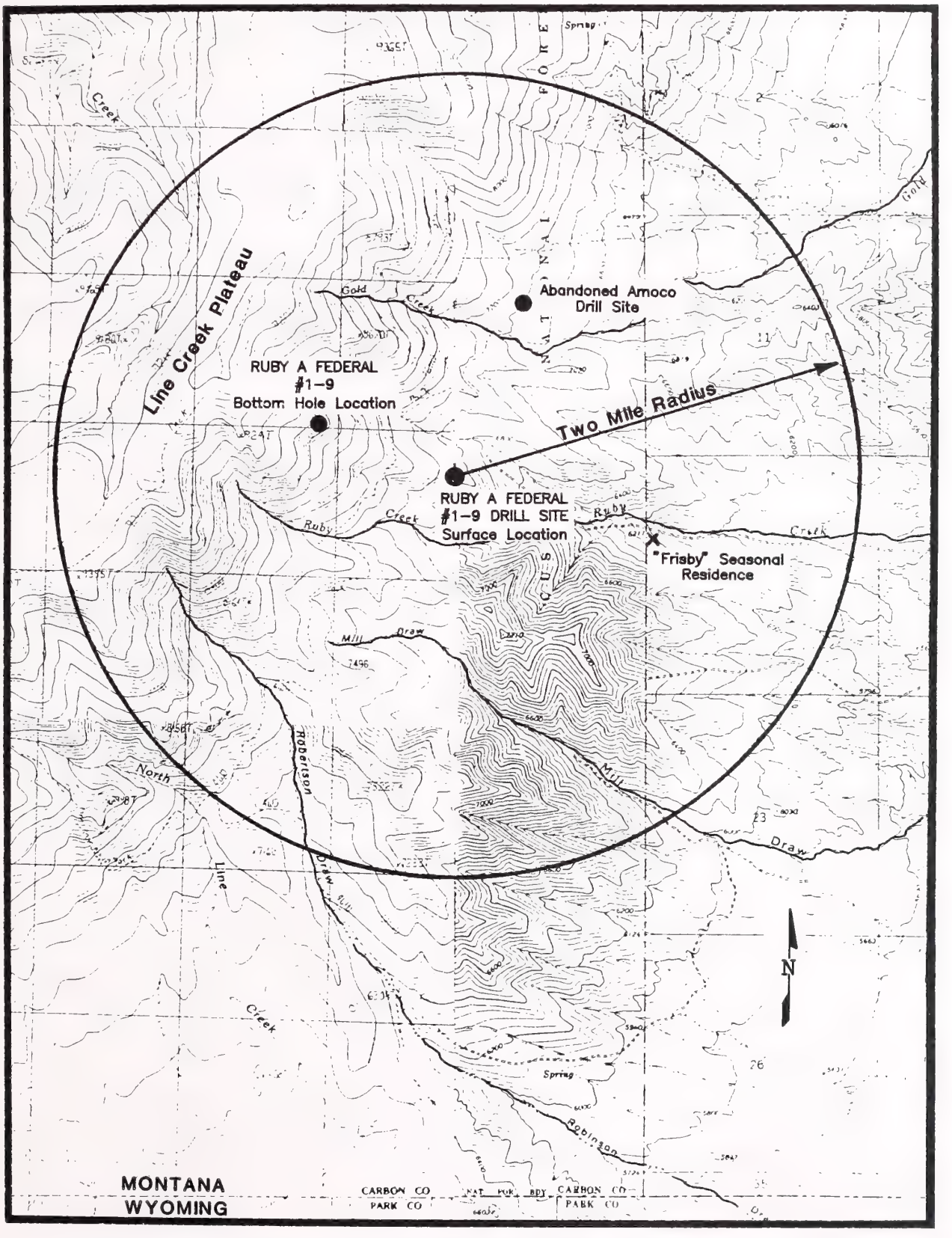

Exhibit E-2. Residences Within Two Mile Radius of Drill Site.

APPENDIX E

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APPENDIX IV
EMERGENCY PHONE NUMBERS
LOCAL, STATE, AND NATIONAL AGENCIES

INDUSTRIAL COMMISSION OIL & GAS DIVISION, Billings, MT

Pete Holm, Field Supervisor	Office: (406)656-0040 Home: (406)286-5434
Joe Simonson, Glendive, MT	Office: (406)365-3592 Home: (406)365-3592

MONTANA STATE DEPT. OF HEALTH, Helena, MT

Dr. John J. Drynan, Director	Office: (406)444-2544 Home: (406)442-6083

RADIO & TELEVISION STATIONS

KRBN Radio, Red Lodge, MT	(406)446-2710
KGHL Radio, Billings, MT Announcer	(406)656-1410 (406)652-1132
KTVQ-TV, Billings, MT	(406)252-5611
KULR-TV, Billings, MT	(406)565-8000

FOREST SERVICE

Beartooth Ranger District, Red Lodge, MT George Weldon Linda Ward-Williams	(406)446-2130
Custer National Forest District, Billings, MT Norman Smyers	(406)657-6361

MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS

Red Lodge, Montana - Shawn Stuart	(406)446-2201
Helena, Montana - John Mundinger	(406)444-2612

CARBON COUNTY EMERGENCY COORDINATOR, Red Lodge, MT

Bill King	Office: (406)446-1694 Home (406)446-3294

APPENDIX E

APPENDIX IV
EMERGENCY PHONE NUMBERS
LOCAL, STATE AND NATIONAL AGENCIES

EMERGENCY AND MEDICAL FACILITIES, Red Lodge, MT		
Ambulance		(406)446-1212
Search and Rescue		(406)446-1234
Hospital		(406)446-2346
DOCTOR		
James Kane	Office:	(406)446-2412
	Home:	(406)446-2418
AIR AMBULANCE		(406)248-4357
DISASTER AND EMERGENCY SERVICES		(406)446-1694
BEARTOOTH AMATEUR RADIO CLUB		
Joe Israel		(406)962-3530
Neil Bloomerater		(406)446-2418
HELICOPTER EVALUATION, Laurel, MT		
D. Bar O Aviation		(406)628-7600
LAW ENFORCEMENT & FIRE FIGHTING AGENCIES, Red Lodge, MT		
Sheriff		(406)446-1234
Highway Patrol		(406)245-6193
Fire		(406)446-1212
Police		(406)446-1313
GOVERNMENT AGENCIES		
24-Hr. Montana Disaster & Emergency Services		(405)444-6911
BUREAU OF LAND MANAGEMENT, P.O. Box 904, Miles City, MT 59301		
Arnie Dougan, Fluid Minerals	Office:	(406)232-4331
Pat Roddy, Petroleum Engineer	Office:	(406)232-4331
	Home:	(406)232-6514
David Breisch, Environmental Scientist	Office:	(406)232-4331
	Home:	(406)232-0605
Jim Graham	Office:	(406)232-4331
	Home:	(406)232-6321
Bill McIlvain	Office:	(406)657-6262

ENVIRONMENTAL PROTECTION AGENCY, Helena, MT

Bill Engle, State Engineer	Office:	(406)449-5432
	Home:	(406)933-5033
Jim Boyter, State Engineer	Office:	(406)449-5432
	Home:	(406)933-5367

APPENDIX E

APPENDIX V - EMERGENCY NUMBERS

COMPANY PERSONNEL TO BE NOTIFIED

Phillips Petroleum Company
6330 West Loop South, Bellaire, Texas 77401
(713) 669-3706

J.K. Fetters Gulf Coast/Western Region Manager	Office: Home:	(713)669-3501 (713)437-0498
M.L. Jones Houston Area Manager	Office: Home:	(713)669-3762 (713)438-0053
J.R. Lee Engineering Director	Office: Home:	(713)669-3551 (713)980-0106
D.C. Gill Production Director	Office: Home:	(713)669-3519 (713)437-0981
R.C. Arnim Drilling Engineering Director	Office: Home:	(713)669-3586 (713)980-6837
R.J. Elmore Drilling Superintendent	Office: Home:	(713)669-3719 (713)980-6605
J.J. Fodor Drilling Engineer	Office: Home:	(713)669-3568 (713)499-6995
J.E. Stark Safety Director	Office: Home:	(713)669-3523 (713)541-1894
Phillips Petroleum Company 152 North Durbin, Second Floor Casper, WY 82601	Office:	(307)237-3791
Ed Hasely Environmental Engineer	Office: Home:	(307)237-5969 (307)472-0511
P.J. Benoit Casper Safety	Office: Home:	(307)237-5961 (307)577-1126
S.H. Oden Casper District Superintendent	Office: Home:	(307)237-5960 (307)473-2340
W.W. Bachus Production Supervisor	Office: Home:	(307)856-8020 (307)956-6795

APPENDIX F

Biological Evaluation

APPENDIX F

Biological Evaluation

THREATENED AND ENDANGERED SPECIES

BIOLOGICAL EVALUATION

For

Phillips Petroleum Company
Ruby A Federal No. 1-9
Exploratory Oil/Gas Well

Prepared by:

Larry D. Hayden-Wing
Archie F. Reeve
Oliver J. Grah

Hayden-Wing Associates
P. O. Box 6083
Sheridan, Wyoming 82801

January 1990

BIOLOGICAL EVALUATION

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APPENDIX F

PROJECT LOCATION AND DESCRIPTION

Phillips Petroleum Company (Phillips) has proposed drilling an exploratory oil/gas well in Carbon County in southwestern Montana. The proposed well, known as the Ruby A Federal No. 1-9 Exploratory Drill Site, is located in the NW1/4 NW1/4 of Sec 15 T9S R20E (Montana Principal Meridian). This location is within the Custer National Forest at the headwaters of Ruby Creek, a tributary of the Clarks Fork of the Yellowstone River (Exhibit F-1). An alternative drill site is proposed by Phillips in the SW1/4 NW1/4 of Sec 10 T9S R20E. This location is also within the Custer National Forest at the headwaters of Gold Creek, also a tributary of the Clarks Fork of the Yellowstone River (Exhibit F-1).

Through the exploratory process, Phillips proposes to determine if hydrocarbons are present and, if so, what the production potential is. To accomplish this, construction of a 2.5-acre drill pad, upgrade and reconstruction of existing unimproved road, and construction of new road would be necessary for either the Section 15 site (Ruby Creek) or the Section 10 site (Gold Creek). These alternatives, as well as the "No Action" alternative, are to be considered by the Forest Service (FS) and the Bureau of Land Management (BLM), as joint lead agencies in the permitting process.

Construction of the drill site, road reconstruction, and new road construction is expected to take approximately four to six weeks, and is scheduled to commence by mid-May 1990. The well would be directionally drilled to a planned depth of 12,520 feet and, barring any major drilling difficulties, is expected to require approximately 150 days for completion. An interrupted drilling program spanning 2 years is anticipated in order to avoid impacts to important elk habitats during the fall and winter seasons. Drilling operations would not extend beyond October 14 unless an extension is approved by biologists of the Montana Department of Fish, Wildlife and Parks (MDFWP). At the end of the first drilling period (June through October 1990), the operation will be shut down and the drill rig stacked for winter. Drilling would resume and be completed the following season (June through October 1991).

It should be noted that the proposed action entails exploratory drilling, testing of the structure, and reclamation of disturbed areas. If producible quantities of oil or gas were encountered, the well would be "shut-in" with no additional development work accomplished until subsequent environmental analysis is accomplished following NEPA regulations. Similarly, if producible quantities of oil or gas were encountered, to justify field development, no development activities would occur until additional environmental analysis was accomplished including coordination with the U.S. Fish and Wildlife Service (USFWS), Montana Natural Heritage Program (MTNHP), and MDFWP.

The impact analysis in this document includes all activities associated with exploratory drilling and potential production of a single well and, in the Field Development Addendum to this document, preliminary analyses of reasonably foreseeable impacts associated with a field development program are presented.

Alternative A - Proposed Action

Alternative A, which is the alternative proposed by Phillips, consists of locating the drill site near the head of Ruby Creek in the NW1/4 of Sec 15 T9S R20E. Access to the drill site would be mostly over existing unimproved roads which would be improved or

APPENDIX F

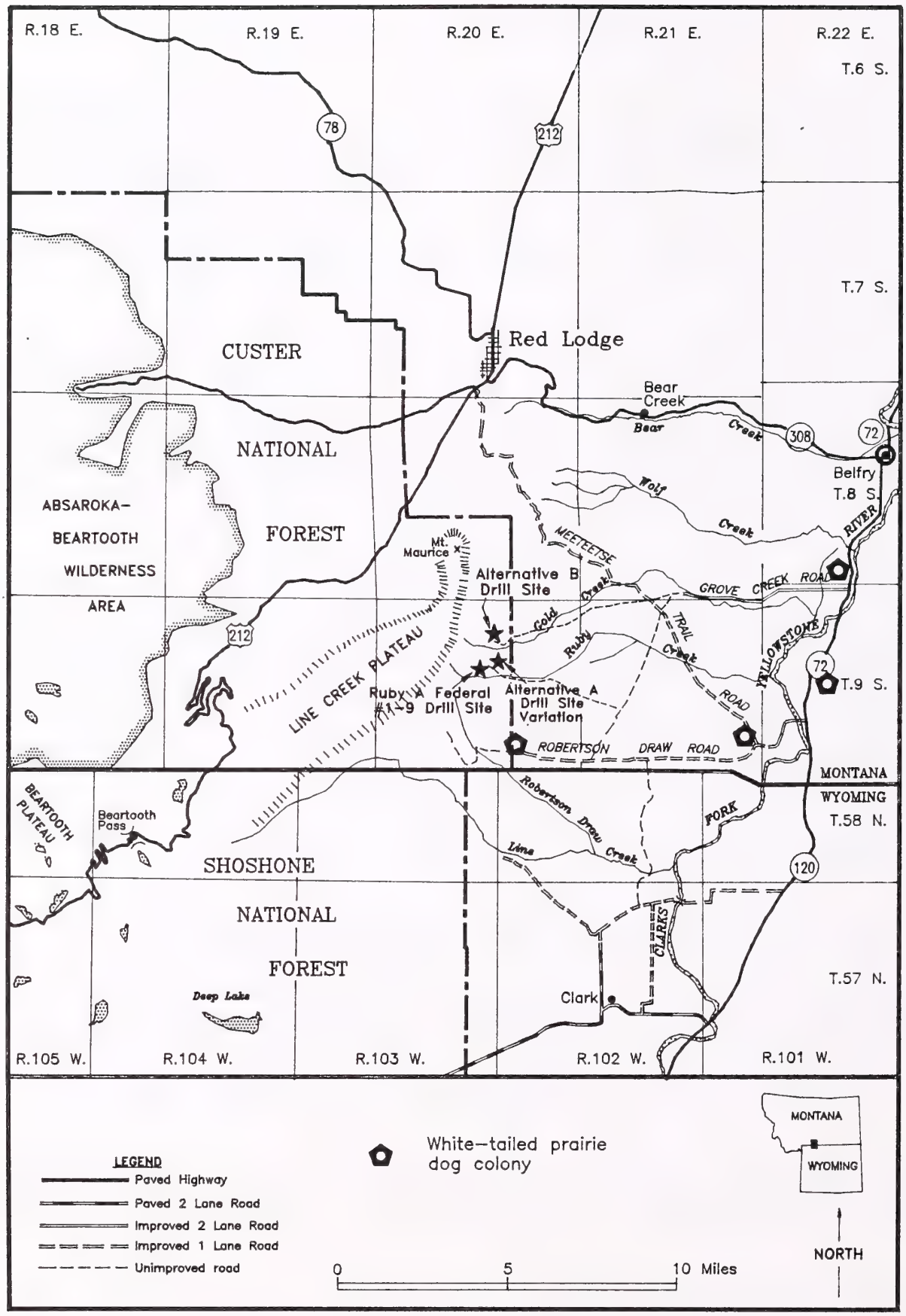

Exhibit F-1. Locations of White-tailed Prairie Dog Colonies in the Vicinity of the Ruby A Federal No. 1-9 Exploratory Oil/Gas Well Project.

reconstructed. Alternative A accesses the proposed drill site via roads from the east which extend westward from State Highway 72 for approximately 14.1 miles to the drill site (Exhibit F-1). A total of 8.8 miles of existing roadway would be reconstructed, and approximately 0.3 miles of new access road would be constructed to the drill site from the end of the existing two-track road which parallels Ruby Creek (Exhibit F-1). The total disturbed area, including the drill site, road improvements, and new road construction would be about 25.3 acres consisting of sagebrush-scrub (20.6 acres), limber pine (4.7 acres), and riparian willow and cottonwood (0.02 acres).

To assist in the FS and BLM decision-making process, four route variations to the proposed drill site (Alternative A) were considered in the analysis of this alternative. These variations are shown on Exhibit F-2 and discussed in detail in the Transportation sections of Chapter 3 and 4. These variations are summarized in the following sections.

Proposed Action (Variation A1)

This variation is Phillips' proposed access route to the Ruby Creek drill site as previously described.

Meeteetse Trail - Robertson Draw Access Route (Variation A2)

The Meeteetse Trail - Robertson Draw Access Route variation accesses the proposed drill site via approximately 22.9 miles of roadway. From Highway 72 this access will follow Grove Creek Road to the Meeteetse Trail Road then on to the Robertson Draw Road to a point where an unimproved two-track road heads north to Mill Draw. The access route follows this two-track road to Mill Draw where it converges with Phillips' proposed access route. A total of 6.8 miles of existing roadway would be reconstructed, and approximately 0.3 mile of new access road would be constructed to the proposed drill site as described for Variation A1. The total disturbed area, including the drill site, road improvements, and new road construction would be about 20.5 acres consisting of sagebrush-scrub (15.8 acres), limber pine (4.7 acres), and riparian willow and cottonwood (0.02 acres).

Southern Access - Robertson Draw Access Route (Variation A3)

The Southern Access - Robertson Draw Access Route variation accesses the proposed drill site via approximately 13.2 miles of roadway. This access route would originate from Highway 72 approximately 2.2 miles north of the Wyoming border. The access route follows a county road across the Clarks Fork to the Robertson Draw Road. No reconstruction, reconstruction, or new construction of the bridge over the Clarks Fork would be required under this access route. From this point, access to the drill site would be identical to the Meeteetse Trail - Robertson Draw Access Route (Variation A2) described previously. A total of 5.8 miles of existing roadway would be reconstructed, and approximately 0.3 mile of new road would be constructed to the proposed drill site as described for Variation A1. The total disturbed area, including the drill site, road improvements, and new road construction would be about 18.0 acres consisting of sagebrush-scrub (13.3 acres), limber pine (4.7 acres), and riparian willow and cottonwood (0.02 acres).

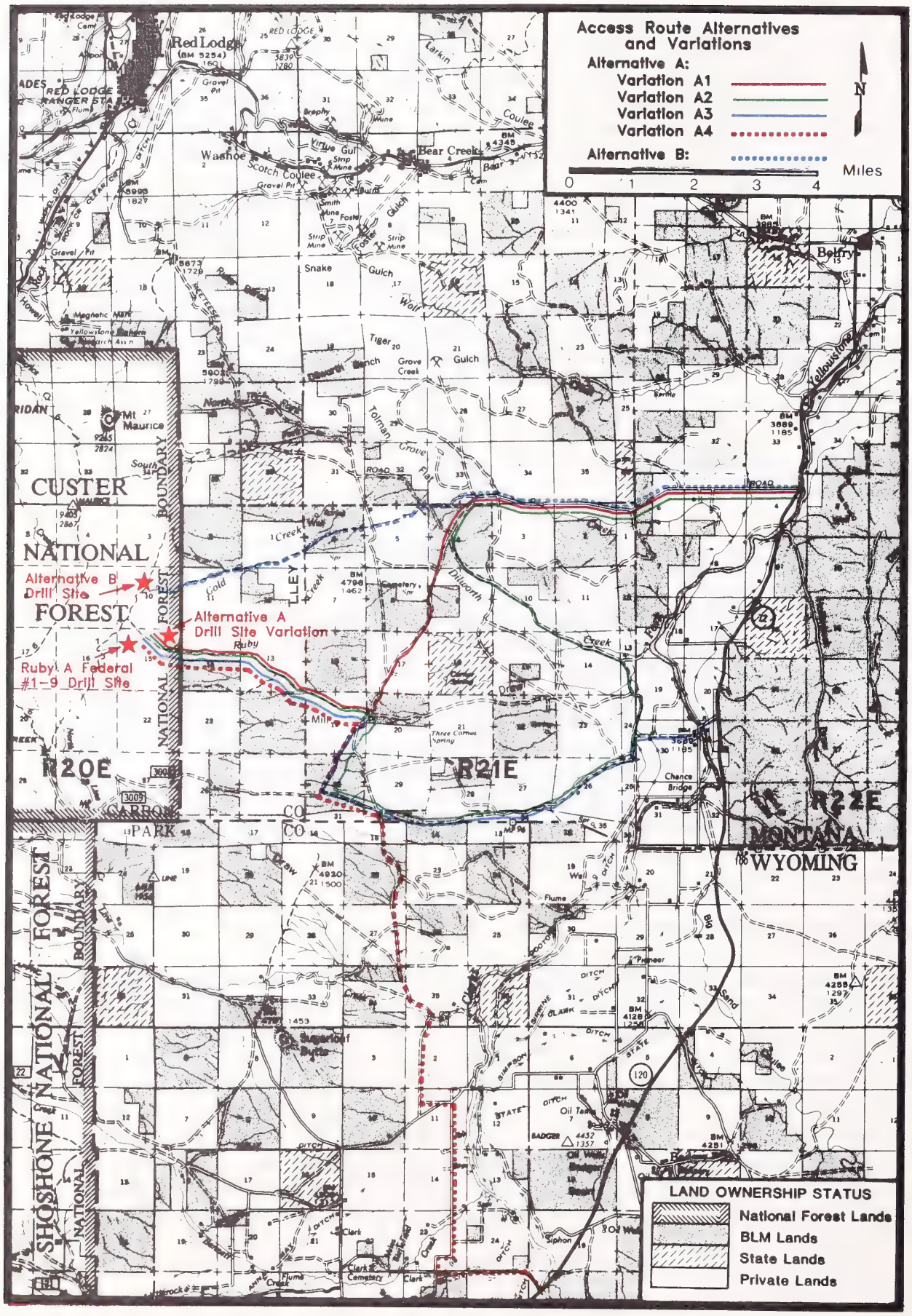

Exhibit F-2. Location of Alternative A Access Route, Alternative A Drill Site Variation, Alternative A Access Route Variations, and Alternative B.

Clark Wyoming Access Route (Variation A4)

The Clark Wyoming Access Route variation originates from Highway 120 approximately 8.6 miles south of the Montana border. Variation A4 accesses the proposed drill site via approximately 18.0 miles of roadway. This access route follows an improved county road towards Clark, Wyoming, to an intersection with county road 8WC where the route turns north along this road to the intersection with county road 8VC. The access route follows this road west then heads north to the Joanne Ranch. The route continues heading north to the Robertson Draw Road where the access route then converges with Variations A2 and A3 and follows this route to the proposed drill site. A total of 10.1 miles of existing roadway would be reconstructed, and approximately 0.3 mile of new road access would be constructed to the proposed drill site as described for Variation A1. The total disturbed area, including the drill site, road improvements, and new road construction would be about 26.3 acres consisting of sagebrush-scrub (21.6 acres), limber pine (4.7 acres), and riparian willow and cottonwood (0.02 acres).

Alternative A Drill Site Variation

The Alternative A Drill Site variation involves locating the drill site on an alluvial bench approximately 2,100 feet east of and 500 feet below the proposed drill site (Alternative A). Access to the Alternative A Drill Site variation would use approximately 13.4 miles of roadway. This access route variation would be the same as that previously described for the proposed drill site except the Alternative A Drill Site variation would require 0.3 mile less new road construction and 0.4 mile less unimproved road construction. The total disturbed area would vary according to access route variation implemented. Implementation of Variation A1, the proposed, would disturb approximately 23.0 acres including the drill site and road improvements, consisting of sagebrush scrub (19.0 acres), limber pine (4.0 acres), and riparian willow and cottonwood (0.02 acres).

Alternative B

Alternative B involves locating the drill pad site near the head of Gold Creek in the SW1/4 NE1/4 of Sec 10 T9S R20E. Access to this site would be over dirt roads which would be improved or reconstructed. Alternative B accesses the proposed drill site via roads from the east which extend westward from State Highway 72 for approximately 11.2 miles to the drill site (Exhibit F-1). A total of 5.3 miles of existing roadway would be reconstructed, and approximately 0.9 miles of new access road would be constructed to the drill site from the end of the existing two-track road which parallels Gold Creek (Exhibit F-1). The total disturbed area, including the drill site, road improvements, and new road construction would be about 20.3 acres consisting of sagebrush-scrub (10.2 acres), limber pine (10.1 acres), and riparian willow and cottonwood (0.03 acres).

No Action Alternative

The implementation of the "No Action" alternative, denial of Phillips' proposal, would result from interference of the proposed action with the existence of any endangered or threatened animal species. If such circumstances were determined by the USFWS, the FS, as lead agency, could deny in entirety, or in part, Phillips' Application for Permit to Drill (APD).

Production - Field Development

If the Ruby A Federal Exploratory Well is productive and further development is proposed, a separate EIS and Biological Evaluation (BE) analyses would be conducted to assess potential impacts of the new proposal. An analysis of field development is presented in the Field Development Addendum to this document.

FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES

Federally listed threatened and endangered (T & E) species and Category 2 Candidate species of birds, mammals, and plants that might occur on or near the project area, or which may be potentially affected by the project, are listed below. Four species have been designated as T & E by the Endangered Species Act of 1973, and as amended. Eight species are designated by the USFWS as Category 2 species (USFWS 1985; Taylor 1989). Category 2 indicates that there is insufficient data available to determine if the species should be recommended for proposal for federal listing. These species are listed below:

Threatened and Endangered Species:

Bald eagle	*Haliacetus leuccephalus*	Endangered
Peregrine falcon	*Falco peregrinus*	Endangered
Black-footed ferret	*Mustela nigripes*	Endangered
Grizzly bear	*Ursus arctos horribilis*	Threatened

Category 2 Species:

Swainson's hawk	*Buteo swainsoni*	Summer resident
Ferruginous hawk	*Buteo regalis*	Summer resident
Mountain plover	*Charadrius montanus*	Summer resident
Long-billed curlew	*Numenius americanus*	Summer resident
Spotted bat	*Euderma maculatum*	Possible resident
N. Amer. wolverine	*Gulo luscus*	Resident
North American lynx	*Felis lynx canadensis*	Resident
Shoshonea	*Shoshonea pulvinata*	Closest Occurrence 3 mi. NNE

None of the federally listed threatened and endangered species listed above were identified during extensive field surveys conducted in June and July, 1989 at either of the drill sites or access alternatives. Additionally, there is no documentation of the regular occurrence of any T & E species or Category 2 species within the project area. However, some of the species listed above are known to occur occasionally, or have the potential to occur, within the vicinity of the proposed project area. The likelihood of such occurrences is considered in the following section.

BIOLOGICAL EVALUATION

HABITAT USE AND STATUS OF SPECIES

Threatened and Endangered Species

Bald Eagle

Bald eagles are known to occur in the region north of the proposed analysis area. Three to 5 bald eagles have been observed to spend winters along Clarks Fork from Bridger, Montana to the Wyoming state line, but spring migrations are concentrated farther east (Flath 1988). Likewise, 3 to 5 bald eagles winter along Rock Creek from Red Lodge, Montana to the confluence with Clarks Fork (Flath 1988). One historic nest, active in 1970-71, was located along Clarks Fork approximately 15 miles south of Silesia, Montana and another nest, in the vicinity of Silesia, was active until 1974 (Flath 1988). In 1986, there were no known active bald eagle nests on the Custer National Forest (USDA - FS 1987).

Because of its distance from the river and general lack of a substantial winter prey base for raptors, the project area is probably not frequently used by bald eagles. However, this species is known to make at least occasional use of the area and has been observed soaring along the cliffs adjacent to the proposed project area during the winter (Stewart 1988).

Suitable winter habitat for bald eagles consists of adequate food resources and shelter (Steenhof et al. 1980, Lingle and Krapu 1986). In the Powder River Basin of Wyoming, wintering bald eagles roost near concentrations of domestic sheep and pronghorn (*Antilocapra americana*) in forests with large, open conifers and snags, often protected from winds by ridges (Anderson and Patterson 1988). In the Bridger-Teton National Forest of Wyoming, wintering bald eagles concentrate along rivers with open water and near ungulate winter ranges with conifer or cottonwood perch trees (Becker 1987). Similar habitat features are utilized by bald eagles wintering on the Custer National Forest (USDA - FS 1987). Carrion from road-kills also provides bald eagles with food during winter (Becker 1987, Reeve 1988), and bald eagles may be struck by vehicles when feeding along roads (Jenkins 1982).

Peregrine Falcon

Peregrine falcons have been reintroduced to the Greater Yellowstone Ecosystem and it is likely that a nesting pair of falcons is present within a 50-mile radius of the proposed project area (Oakleaf 1988). There have been consistent sightings of peregrines 40 to 50 miles east of the proposed sites, in the Pryor Mountains (USDA - FS 1987). Peregrines have been released at Beartooth Creek, north of Red Lodge (Oakleaf 1988) and falcons have been observed on the Beartooth Ranger District, Custer National Forest, where 120,800 acres have been designated as essential habitat for this species (USDA - FS 1987).

Peregrine falcons may occur in Montana during migrations and as a result of the reintroduction program during the nesting season (Taylor 1988). In the northern Rocky Mountains nests are usually at elevations below 10,000 feet (Peregrine Falcon Recovery Team 1977, Oakleaf 1988) on steep cliff faces often overlooking water (USDA - FS 1987). Hunting areas are usually within 17 miles of the nest site. Prey species include passerine birds, waterfowl, and shorebirds and prey abundance dictates where

peregrines concentrate hunting activities. Habitats in which these prey are found include croplands (hayfields, orchards, grainfields), meadows, riparian zones, wetlands, marshes, mixed forests, shrub steppes, and lakes (Peregrine Falcon Recovery Team 1977). Suitable nesting habitat exists within the Beartooth Ranger District, Custer National Forest (USDA - FS 1987).

Black-footed Ferret

Although Montana is within the original range of the black-footed ferret (Clark et al. 1987) and one ferret was confirmed south of Billings, Montana in 1943 (Clark et al. 1987), no black-footed ferrets are known to occur or occurred historically in the vicinity of the proposed project area. However, recent reports of black-footed ferrets have been made in the vicinity of Dilworth Bench in the southwest portion of T8S R21E (Flath 1988). These reports were be investigated during winter 1988-1989 (Flath 1988).

It is well known that black-footed ferrets depend on prairie dogs (*Cynomys* spp.) for food and prairie dog burrows for shelter (Hillman and Clark 1980, Fagerstone 1987). White-tailed prairie dogs (*C. leucurus*) occur in the vicinity of the proposed access routes in several small colonies. These are probably at the western and southern extent of white-tailed prairie dog range in Montana (Flath undated). Locations of the four white-tailed prairie dog colonies nearest the proposed drill sites and access routes are illustrated in Exhibit F-1 and described in Table F-1. These colonies were surveyed during the late 1970's by Flath (undated), who states that other undocumented prairie dog burrows are scattered throughout the area (Flath 1988). The colony surveyed in Robertson Draw (Sections 26 and 27, T9S R20E) is the largest of any of the 13 colonies surveyed in Montana (Flath undated) and colonies in Section 24 (T9S R21E) and Section 20 (T9S R22E) appear to have expanded since the late 1970's survey (Flath 1988). None of the access routes currently under consideration pass through any of these prairie dog colonies.

Table F-1. Locations, Size, and Land Ownership of White-tailed Prairie Dog Colonies in the Vicinity of the Phillips Petroleum Company Ruby A Federal Exploratory Drill Site Alternatives.

Colony Location	Estimated Size (acres)	Land Ownership (acres)
S33 T8S R22E	2	Private - 2
S16 S17 S20 T9S R22E	75-100	Private - 75-100
S24 T9S R21E	19	Private - 19
S26 S27 T9S R20E	248	Private - 176 USDA-FS - 48 USDI-BLM- 24

(Source: Flath undated)

Even though the most recent population of black-footed ferrets found was in white-tailed prairie dog colonies near Meeteetse, Wyoming, reintroduction of ferrets to Montana will probably be in black-tailed prairie dog (*Cynomys ludovicianus*) colonies in northern and eastern parts of the state (Clark et al. 1987). If ferrets are discovered in Montana and the population is sufficiently large (20 adults), some would be translocated to another site to avoid extinction (Maguire et al. 1988) although a very small population would probably necessitate capture for use in captive breeding programs (Flath 1988).

Grizzly Bear

The best grizzly bear habitat in the Custer National Forest is located in the upper Stillwater River area of eastern Park and Stillwater Counties, Montana (USDA - FS 1987). This area, as well as areas in the Gallatin National Forest in the vicinity of Crazy Mountain, and the Shoshone National Forest in the vicinity of Beartooth Butte, are the officially-designated grizzly bear management areas closest to the proposed project area (Exhibit F-3). Of these areas, the nearest is in the Shoshone National Forest, approximately 10 miles southwest of the proposed sites and is classified as Management Situation II. Characteristics of Management Situation II habitat include:

1. Population and Habitat Conditions - Current information indicates that these areas lack distinct grizzly population centers; highly suitable habitat does not generally occur, although some grizzly habitat components exist and grizzlies may be present occasionally. Habitat resources in Management Situation II either are unnecessary for survival and recovery of the species, or the need has not yet been determined but habitat resources may be necessary. The status of such areas is subject to review and change according to demonstrated grizzly population and habitat needs.

2. Management Direction - Use by the grizzly bear is important but is not the primary use on the area. In some cases, habitat maintenance and improvement may be an important consideration. Minimization of grizzly-human conflict potential that could lead to human-caused mortalities is a high management priority. In this management situation, managers would accommodate demonstrated grizzly populations and/or grizzly habitat use in other land-use activities if feasible, but not to the extent of exclusion of other use needs. Management will at least maintain those habitat conditions which resulted in these ares being stratified as Management Situation II. (Interagency Grizzly Bear Team 1986).

According to available information, there have been no sightings of grizzly bears along the east front of the Beartooth Plateau nor any bears seen along the Montana-Wyoming state line south of the proposed drill project area (Roop 1988). However, during August, 1988, a sow with two cubs was observed near Long Lake in Wyoming (Sec 1 T37N R105W) approximately 3 miles south of the state line (Hammond 1988). Forest fires during the summer of 1988 may have displaced some grizzly bears but neither the Clover Mist nor the Hellroaring fires were close to the proposed project area and probably had little effect on any bears in the vicinity of the sites (Roop 1988).

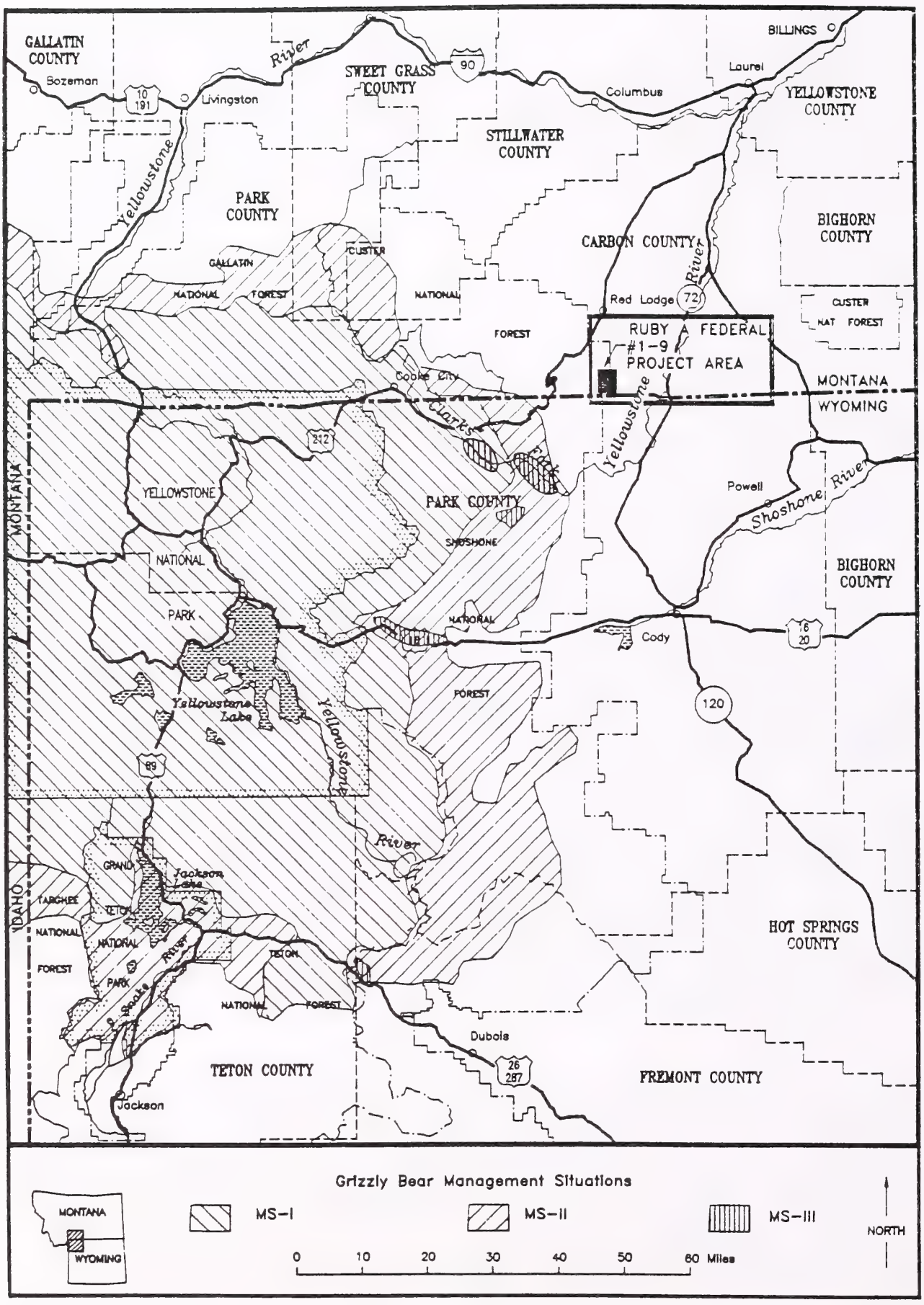

Exhibit F-3. Grizzly Bear Habitats in the Greater Yellowstone Area.

BIOLOGICAL EVALUATION

Category 2 Candidate Species

Swainson's Hawk

In Montana and Wyoming, Swainson's hawk is common during spring and summer (Oakleaf et al. 1982, Taylor 1988). Nesting is likely to occur in a variety of habitats below 9,000 feet that provide open areas for foraging (Oakleaf et al. 1982). In Montana, nesting habitats include croplands, grasslands, sagebrush scrub, mountain shrub, coniferous forests with openings created by burns or logging, and mountain valleys and meadows (Taylor 1988). As with other raptor species, the diet of Swainson's hawks varies with prey availability (Craighead and Craighead 1969). Most Swainson's hawks nest in trees which are often large and isolated with high visibility of the surrounding area (Dunkle 1977; Call 1978).

Although no Swainson's hawks have been documented as nesting or migrating in the vicinity of the proposed project area, they are expected to occur (Flath 1988). There are a variety of nesting substrates available including cottonwood trees and scrub willows along riparian zones. *Although* buttes, cutbanks, ground, and human-made features such as telephone poles are known nest substrates (Dundle 1977), and are all present in the project area, *no evidence of Swainson's hawk was found during extensive surveys conducted in June, 1989 along each of the road access alternatives and variations.*

Ferruginous Hawk

There are no records of ferruginous hawks in the vicinity of the proposed project area and their occurrence there seems unlikely (Flath 1988). Ferruginous hawks are rare in Montana during spring and summer; nesting is east of the Continental Divide (Taylor 1988). Since this species does not nest in heavily wooded areas (Call 1978), it is unlikely that it would be found near either alternative drill site.

According to Call (1978) and Millsap (1979), ferruginous hawks are mostly found in the western plains, nesting in trees along streams; on low cliffs, buttes, boulders, pinnacles, junipers, and sagebrush; on the ground; or on man-made structures. These habitat features occur in the vicinity of the proposed drilling project, particularly along one or more of the access routes, and make the area potentially suitable for ferruginous hawks. In Wyoming, ferruginous hawks have been observed in a variety of habitats including riparian cottonwoods, basin and shrub steppe, Great Plains grassland, and rock outcrops associated with these habitats (Oakleaf et al. 1982). Generally, this species occurs where visibility is quite high and, in part, this may contribute to the species' relatively high sensitivity to human disturbances (Sutter and Joness 1981; Taylor 1988).

Mountain Plover

Mountain plovers are known mostly from northcentral and eastern Montana (Olson-Edge and Edge 1987; Taylor 1988) where they are associated with semi-arid grasslands, shortgrass prairie, plains, and plateaus (Taylor 1988). However, mountain plovers have been described as inhabiting black-tailed prairie dog towns in northcentral Montana (Knowles et al. 1982; Olson-Edge and Edge 1987). In these situations, vegetation is less than 10 cm high, similar to short grass prairie and low vegetation maintained by grazing (Parrish 1988).

No mountain plovers are known to occur on or in the vicinity of either drill site alternative or along any of the potential access routes. However, mountain plovers have been seen in northern Park County, Wyoming approximately 10 to 15 miles south of the project area (Roop 1988; Greenquist 1988). These birds were observed during May breeding bird surveys in short grass vegetation with interspersed boulders and rocks. Similar habitats exist in the vicinity of the potential access routes described above, *however, no evidence of mountain plover was found during extensive surveys conducted in June 1989 along each of the access routes or drill sites.*

Long-billed Curlew

Long-billed curlews are expected to occur in the vicinity of the proposed access roads, in hayfields, subirrigated or flood irrigated fields (Flath 1988). In Wyoming, two pairs of curlews, one with young, were observed during May 1988 on a bench above the Clarks Fork of the Yellowstone River 10 to 15 miles south of the Ruby Creek drill site (Roop 1988). These birds were in the same habitat as the mountain plovers, described above. Elsewhere in Wyoming, long-billed curlews select areas of low vegetation in hay meadows that have been grazed by cattle or cultivated (Cochrane 1983). The decline of long-billed curlews may be attributed to conversion of short grass meadows to taller grass hays (Cochrane 1983). One incidental sighting of a long-billed curlew (Steward 1989) was made along the west end of Robertson Draw Road during the spring of 1989, but it is not known whether this individual was a migrant or a member of a breeding pair preparing to nest in the area. No documented evidence of breeding/nesting curlews or plovers exists for the project area and adjacent areas, *and no evidence of long-billed curlews was found during extensive surveys conducted in June, 1989, along each of the road access alternatives and variations.*

Spotted Bat

The spotted bat is suspected to occur in Carbon county, Montana (Taylor 1988) which is near its northern limit of distribution in the United States (Snow 1974). Only one specimen has been collected in Wyoming, near Byron in Big Horn County (Long 1965). In other parts of its range, the spotted bat inhabits open or scrub country, coniferous forests, sagebrush, ponderosa pine-dominated terrain, and frequents limestone cliffs near water sources (Snow 1974; Clark and Dorn 1981). Although Taylor (1988) suggests the species is vulnerable to habitat loss, only those disturbances which eliminate water near sedimentary cliffs (Snow 1974) or dams which inundate cliff faces and canyon walls (Snow 1974; Clark and Dorn 1981) have been identified as potential human related impacts to the species.

North American Wolverine

Wolverines probably occur in the vicinity of the proposed project area and on the Line Creek Plateau (Flath 1988). Indeed, Montana has the highest wolverine population within the conterminous United States (Wilson 1982) and they are classified as furbearers (Taylor 1988). Recent wolverine observations in western Wyoming have been at elevations between 6,475 and 11,000 feet (Hoak et al. 1982). In general, wolverines are mostly found in wilderness situations where there is minimal human-related activity and development (Hash 1987). While wolverines are opportunistic feeders (Hash 1987), they prey on big game, especially in winter when snow inhibits big game movements (Wilson 1982), and scavenge carrion of various species (Hash 1987).

BIOLOGICAL EVALUATION

North American Lynx

Lynx in Montana are most common in the northwestern and northcentral portions of the state and decline in abundance in the south (Hoffmann et al. 1969). One lynx was captured in upper Yankee Jim Canyon on the Yellowstone River in Park County between 1954 and 1969 (Hoffmann et al. 1969) but none have been documented in the vicinity of the proposed project area (Flath 1988). During a recent survey of lynx in Wyoming, lynx tracks were reported near the Montana border, south of the proposed drill site. One set of tracks was seen in Sec 19 T58N R107W, the other in Sec 04 T57N R106W (Reeve et al. 1986). Both observations were during 1985, in spruce-fir (*Picea* sp. - *Abies* sp.) forest.

Typically, the lynx is associated with large areas of dense boreal forests, broken by bogs and rock outcrops (McCord and Cardoza 1982). Lynx may also frequent early successional stages of forest growth and other vegetation types if prey species are present (Nellis 1971; Parker 1980). Lynx are somewhat dependent on snowshoe hares (*Lepus americanus*) for food although they will use alternative prey including carrion (Saunders 1963; Nellis et al. 1978), small mammals (van Zyll de Jong 1966; Moore 1979), and various grouse and other bird species (van Zyll de Jong 1966; Brand et al. 1976; Brand and Keith 1979).

Shoshonea

Shoshonea (*Shoshonea pulvinata*) is a low-growing, cushion-shaped and pleasantly aromatic perennial herb arising from a woody taproot as described by Evert and Constance (1982). Its leaves are petiolate, unequally pinnate or odd pinnate, and leathery; the blade outline is ovate to oblong while the leaflets are oblanceolate, linear, or cuspidate; lower leaflets are often lobed; the inflorescence is a subcompact compound umbel of yellow flowers which are sessile if perfect and pedicellate when staminate; and the fruit is a pericarp with a lignified layer of tissue. The species is restricted to calcareous outcroppings and soils derived from limestone within limber pine and Douglas-fir woodlands at elevations ranging from 7,100 feet to 7,800 feet.

The MTNHP gives this Category 2 plant a Global G3 and State S1 rankings. A Global G3 ranking indicates that the plant is either very rare and local throughout its range or found locally in a restricted range, or because of other factors making it vulnerable to extinction throughout its range. A State S1 ranking indicates that the plant is critically imperiled in Montana because of extreme rarity, or because of some factor of its biology making it especially vulnerable to extirpation from the state.

The MTNHP data base indicates that there are only three known populations of the species in Montana; two populations occur in the Pryor Mountains located approximately 50 miles east of the proposed project. The closest population occurs 3 miles north northeast of the project area. That population occurs in three large subpopulations and covers approximately 50 acres of privately owned land at an elevation of 7,140 feet in the Meeteetse Spires area approximately 5 miles northeast of the project area. The site is in an almost completely undisturbed location at the Grove Creek pinnacles on gravelly limestone soils on windblown ridge tops vegetated with an overstory of scattered limber pine and Douglas-fir and among such understory species as Howard's alpine forget-me-not, Henderson spring parsley, and kelseya. Very few weedy species occur at the site which was last observed in 1986. There were an estimated 6,000 to 8,000 plants in the three subpopulations, with

approximately 3,000 to 4,000 plants in the south site. *No evidence of Shoshonea was found during extensive surveys conducted in July, 1989 along each of the access routes or at the drill sites.*

METHODS

The assessment and recommendations contained within this Biological Evaluation were derived from information obtained from the following sources: (1) on-the-ground and aerial inspections of the access alternatives and drill site, (2) personal and telephone interviews with concerned parties and biological specialists, (3) meetings with state and federal agency specialists in Red Lodge and Billings, (4) examination of pertinent data in state and federal agency files, and (5) the review of pertinent biological and management literature.

A. Site Inspections

Ground reconnaissance and field evaluations of the project area were made by L. D. Hayden-Wing and O. J. Grah on October 4 and 5, 1988. Wildlife habitats and sign, as well as interrelationships to other area activities, were documented within the proposed project area. The location of the proposed project components were searched for the existence of Shoshonea individuals and/or suitable habitat during the field reconnaissance. In addition, a helicopter reconnaissance of this area was made by Hayden-Wing on November 11, 1987. *Additional site-specific surveys were completed during the summer of 1989.*

B. Personal Communications

Individuals personally interviewed during the fact finding process include: Mr. Shawn Stewart, District Biologist, MDFWP, Red Lodge; Dr. Fred Van Dyke, Research Biologist (MDFWP), Red Lodge; and Mr. Larry Roop, Grizzly Bear Specialist and District Biologist, Wyoming Game and Fish Department (WGFD), Cody. In addition, telephone interviews were conducted with Dr. Richard Knight, Leader, Interagency Grizzly Bear Study Team, U.S. Park Service, Bozeman; Mr. Rob Hazelwood and Mr. Dale Harmes, Threatened and Endangered Species Regulatory Authority, USFWS, Helena; Mr. Dennis Christopherson, Threatened and Endangered Species Regulatory Authority, Billings; Dr, Harold Picton, Professor of Zoology, Montana State University, Bozeman; Mr. Dan Bricco, District Wildlife Management Biologist, BLM, Miles City; Mr. Eric Greenquist, Resource Area Wildlife Management Biologist, BLM, Cody; Mr. Robert Oakleaf, Non-Game Coordinator, WGFD, Lander; Mr. Dennis Flath, MDFWP Non-game Biologist, Bozeman; and Mr. Forrest Hammond, WGFD Grizzly Bear Biologist, Cody.

C. Meetings with Agency Specialists

Meetings with state and federal agency specialists include: (1) Red Lodge on 11-12-87 with USFS, BLM, and MDFWP, (2) Billings on 12-01-87 with USFS, BLM, and Phillips, (3) Red Lodge on 10-04-88 with USFS and MDFWP, (4) Cody on 11-22-88 with WGFD, and (5) Red Lodge on 12-19-88 with USFS and MDFWP.

D. Unpublished Agency Reports and Data

All available information on T & E species in the project area was copied or excerpted for use in preparing the Biological Evaluation. Materials reviewed included habitat

maps, prairie dog colony locations, graduate theses, previous impact assessments for the area and region, the FS Land and Resource Management Plan for the Custer National Forest, and the BLM Resource Management Plan for the Billings Resource Area. Most materials were obtained from the FS Beartooth District Ranger's office in Red Lodge and the District Office of the MDFWP in Red Lodge. Other materials were obtained from the FS Supervisor's Office in Billings, the BLM District Office in Miles City, the District-2 Office of the WGFD in Cody, the BLM Resource Area Office in Cody, the State Non-Game Office of the WDFD in Lander, and the Biological Services Office of the WGFD in Cheyenne.

E. Published Literature

Although relatively few published scientific papers pertain directly to the specific circumstances and issues involved in this analysis, those references which were applicable to listed species on or near the project were reviewed and pertinent facts documented and cited in the Biological Evaluation.

F. Environmental Impact Statement Preparation

L. D. Hayden-Wing and O. J. Grah are members of the ID team preparing the project EIS for the Ruby A Federal No. 1-9 Exploratory Oil/Gas Well. In this role, they have been involved in the analyses of T & E species and impacts in the analysis area from November, 1987 through the present time. These analyses have included numerous meetings and work sessions with ID team members and agency biologists that were pertinent to the preparation of the respective impact analyses for the EIS and BE documents.

EFFECTS OF THE PROPOSED ACTION

Alternatives A and B both occur within similar habitats and are within 1 mile of each other. In each case, the drill pad would be constructed on east-facing slopes in limber pine (*Pinus flexilis*) woodland and at elevations between 6,800 and 7,000 feet. *The Alternative A Drill Site variation would be constructed on an alluvial bench in a sagebrush-scrub vegetation community type at an elevation of 6,500 feet.* Access routes to each of the alternative drill sites would be primarily along existing improved and unimproved roads, with relatively small amounts of new road construction. *Access to the Alternative A Drill Site variation would be similar to access for the proposed drill site (Alternative A) except 0.3 mile of new road construction and 0.4 mile of road reconstruction would not be required for the Alternative A Drill Site variation.* In both cases, access routes pass through sagebrush scrub vegetation for most of their respective lengths and each parallels, then passes through, riparian zones (cottonwood and willow scrub vegetation) for short distances. Consequently, the effects of the proposed action on T & E species and Category 2 species are, except for minor differences, judged to be identical for both alternatives. The following description of impacts is, therefore, equally applicable to both alternatives. Where there are minor exceptions to this circumstance, they are so indicated.

APPENDIX F

Direct and Indirect Impacts - Alternatives A and B

Bald Eagle

A few bald eagles occur during the winter along the Clarks Fork of the Yellowstone River and Rock Creek drainages and are known to make at least occasional use of the project area where they have been observed soaring along the cliffs adjacent to the drill sites (Stewart 1988). Because of the distance from the river and general lack of a substantial winter prey base for raptors, the drill sites are probably not frequently used by bald eagles. No bald eagle nests are known or suspected to occur in the area.

No direct impacts related to the habitat disturbances of site development are anticipated. However, accidental discharge of toxic chemicals or petroleum products into waterways could, if released in sufficient quantity, cause direct mortalities of this species or indirectly impact them by reducing fish abundance. The chance of this happening, however, is remote since all drilling fluids would be held in tanks and drill cuttings would be contained in environmentally-approved and lined trenches.

During winter when water sources freeze, bald eagles wintering along the Clarks Fork of the Yellowstone River may utilize big game carrion for food. Additional traffic along Montana State Highway 72 could result in increased big game-vehicle collisions. Bald eagles feeding on carcasses along roadsides would, in turn, be potential victims of vehicular collisions. The possibility of such indirect bald eagle mortalities occurring on either of the alternative access routes would become less likely with increasing distance from the Clarks Fork valley. Since no winter activities on the project are proposed, vehicular collisions with bald eagles is not expected to be a problem.

Peregrine Falcon

No nests of peregrine falcons are known to occur near either alternative drill site and the likelihood of peregrines in the project vicinity is remote. However, this species is expanding its range throughout the Greater Yellowstone Area, including the Beartooth Ranger District of the Custer National Forest. If peregrines are found to utilize the Clarks Fork drainage in the future, accidental discharge of toxic chemicals or petroleum products into waterways could adversely affect this species if prey, including waterfowl, ingest toxic compounds. Because of the design of chemical storage and drilling by-products containment, the chance of such discharge is remote.

Black-Footed Ferret

No black-footed ferrets are known to inhabit any of the prairie dog towns east of the proposed project area. Furthermore, there are no historical records of black-footed ferrets in any of the white-tailed prairie dog colonies in southern Montana. However, recent unconfirmed reports of ferrets in the vicinity of Dilworth Bench have prompted the MDFWP to plan surveys for ferrets during the winter of 1988-1989. Discovery of this endangered species would prompt immediate revision of this Biological Evaluation.

Access roads that are under consideration for both drill site alternatives share a common route for the first 5.3 miles west of State Highway 72. This segment of access and the roads that diverge from it to each alternative drill site do not pass through or immediately adjacent to any known prairie dog colony (Table 1; Exhibit F-1). Except for approximately 72.0 acres of the Robertson Draw prairie dog colony, all prairie dog

colonies documented in the area are on private land and not within the management direction set forth by the FS to retain prairie dog acreage at the 1972 level (USDA - FS 1987). However, the spirit of the FS management direction would be violated if any prairie dog colonies were altered by road construction in accessing either drill site alternative. Access roads would be upgraded but no major realignment is proposed and, consequently, no white-tailed prairie dog colonies would be affected by either proposed alternative.

If, during the life of the proposed project, ferrets are discovered in the vicinity of any access road, the increased traffic levels and speeds on these roads would create the risk of vehicles killing or injuring ferrets. Night traffic on these roads would exacerbate the increase in mortality risk. Also, the upgraded roads could increase public use and the possibility of people shooting prairie dogs and black-footed ferrets.

None of the prairie dog towns in southern Montana have been proposed for black-footed ferret reintroduction (Clark et al. 1987).

Grizzly Bear

Since no designated grizzly bear habitat occurs within the vicinity of the proposed project or project area, and there have been no sightings of grizzly bears along the east front of the Beartooth Plateau nor on the big game winter range along the Montana-Wyoming state line south of the proposed project area (Roop 1988; Stewart 1988; Knight 1989), impacts to this species are not anticipated. The designated grizzly bear habitat nearest the drill sites is Management Situation II habitat in the Shoshone National Forest, approximately 10 miles southwest (Exhibit F-3). Although bear sightings in Management Situation II habitat are not common and the chance of grizzly bears occurring outside known habitat is even more remote, any encounter with humans could result in injury or death to both. Human encroachment into grizzly bear habitat and human-bear conflicts are major issues in managing the recovery of this species (Peak et al. 1987) but are not likely to occur as a result of the proposed project.

Swainson's Hawk

No nests are known to occur on or near the proposed project area and, since access to either alternative drill site would be almost entirely on established roads, no nests would be disturbed and nesting substrates would not be eliminated by access road development. No disturbance to the prey base utilized by this species is expected. Consequently, no direct or indirect impacts to Swainson's hawks are anticipated.

Ferruginous Hawk

This species is not known to occur, either as a migrant or during the nesting period on or near the project vicinity. The proposed locations of drill site alternatives are not in habitats normally utilized by ferruginous hawks for nesting, and no nesting substrates would be disturbed by access road development. Consequently, no direct or indirect impacts to ferruginous hawks are anticipated.

Mountain Plover and Long-billed Curlew

Although habitats similar to those in which long-billed curlew and mountain plover were found nesting in Wyoming do occur along proposed access routes (Roop 1988 and

conducted in June, 1989 along each of the road access alternatives and variations. Stewart (1989) sighted a single long-billed curlew in the general project area during the spring of 1989 but it is likely that this bird was a migrant since the subsequent survey turned up no evidence of nesting curlews in the area. If these species were present, the heavier traffic levels associated with the proposed action may increase the number of birds killed on the road by moving vehicles, thereby creating a direct impact. These birds are the most susceptible to road mortality during the early summer when young birds are present. Access through areas in which these species could occur would be via existing roads, which will be improved, and is not expected to impact plover or curlew habitats. Impact to these species *appear unlikely since nesting apparently does not occur within the project area.*

Spotted Bat

This species may occur in the vicinity of the proposed project, but is not likely to be affected since habitat features such as water holes and cliff faces would not be disturbed by any aspect of project development. Consequently, no direct or indirect impacts to spotted bats are anticipated.

North American Wolverine

Wolverines may occur on the Line Creek Plateau but, although they are wide-ranging, they normally avoid human-related activities and developments. The proposed project is not expected to impact the prey base of the wolverine and conflicts are not expected to occur.

North American Lynx

No lynx are know to occur in the vicinity of the proposed project. A very remote possibility exists for encountering an animal on the road and striking it with a vehicle. The proposed project is not expected to impact the prey base of the lynx. Coordination measures, listed below, would reduce or eliminate any direct or indirect impacts to this and other species.

Shoshonea

As indicated previously, the closest population of Shoshonea to the project area is 5 miles north northeast. The upper portion of the project area exhibits suitable habitat for the species. *Since July, 1989 field surveys found no evidence of Shoshonea in the project area, impacts to this species is not anticipated.*

Direct and Indirect Impacts - No Action Alternative

The No Action Alternative produces no adverse impacts to threatened, endangered, or Category 2 candidate species.

CUMULATIVE EFFECTS

Increases in cumulative impacts would come mainly from: (1) the additional traffic volume associated with the proposed action, and (2) increased public access to areas that were previously more difficult to reach. These potential increases in cumulative

impacts would occur under both Alternative A and Alternative B since both include road improvements that would increase traffic levels from both project and public users. Levels of these types of impacts would be somewhat greater under Alternative A since more miles of road improvement are planned.

The additional traffic volume associated with the proposed action has the potential to increase the potential for impacts to several species. Increased vehicular collisions with big game and other wildlife may increase the production of carrion along roads which would in turn attract scavengers, including bald eagles and possibly lynx and wolverines. The chance for deleterious effects to these species would be increased if winter operations were undertaken. Since no winter activities are proposed, however, the likelihood for increasing the probability of impact to these species above that of pre-project levels is very low.

Improved and reconstructed existing roads and the construction of new roads may increase accessibility of some areas to the general public and moderately increase the chance of illegal harvest of lynx and wolverine, both classified as furbearers in Montana. However, the fact that access through much of the western portions of the proposed project area is controlled and traverses gated private and FS lands, would greatly reduce the potential for occurrence of this type of impact.

IMPACTS SUMMARY

Impacts to threatened, endangered, and Category 2 candidate species could result from the following: (1) construction and use of new roads to drill sites, (2) improvement, reconstruction, and increased use of existing roads, (3) the clearing and use of drilling sites, and (4) the possible spillage of toxic chemicals or petroleum products at the well site. The potential environmental consequences of these activities to T & E species and candidate species includes: (1) temporary physical loss of habitat, (2) displacement of these species due to human activities, (3) increased mortality and injuries from collisions with vehicles, (4) increased potential for illegal harvest to furbearers, and (5) direct and indirect affects to bald eagles and peregrine falcons caused by accidental spills of toxic chemicals or petroleum products into waterways.

COORDINATION MEASURES

The following procedures are recommended to eliminate or substantially reduce potential adverse effects of the proposed action to threatened, endangered, and candidate species.

Bald Eagle

1. The maintenance of vehicle speeds at posted limits on State Highway 72 and speed reduction on improved access roads would reduce the potential for collisions with big game. This is particularly important during the first few hours after sunset when deer are most active. Less carrion on roadsides would reduce the chance for bald eagles colliding with vehicles.

2. Cooperate with the MDFWP and the WGFD in reporting big game killed by vehicles and assist in removing carcasses from roadsides.

penalties associated with interference with the survival of threatened and endangered species and illegal harvest to furbearers.

4. Require drivers to participate in a training program describing the type of wildlife in the area and those that are susceptible to vehicular collisions, the circumstances under which collisions are likely to occur, and the measures that can be employed to minimize them.

5. Employ high construction standards and rigid safety precautions to minimize the potential for an accidental spill or discharge of any chemical or petroleum product. If such an accident does occur, notification of the USFWS Endangered Species Office in Helena, the MDFWP non-game biologist in Bozeman, and the USDA - FS biologist in Red Lodge would be necessary to evaluate the effects on bald eagles and their habitat.

6. If, in the future, bald eagles nest in this area or an increase in numbers of bald eagles using the area occurs, consultation with USFWS must be re-initiated and new assessments of effects determined.

Peregrine Falcon

1. Items 3, 5, and 6 described under bald eagles are also applicable to peregrine falcons.

2. Phillips should maintain contact with the MDFWP non-game biologist in Bozeman to update the status of introduced peregrine falcons in the vicinity of the project.

3. A helicopter survey of cliff habitats in the vicinity of the proposed well sites should be performed prior to commencement of drilling activities to determine whether or not peregrine falcons are nesting there (Hazelwood 1989).

Black-footed Ferret

1. In order to protect white-tailed prairie dog colonies (the primary food source of black-footed ferrets), do not change the alignment of existing roads used for access to the *proposed* drill sites without first ensuring that the realigned route would not traverse any portion of a prairie dog colony.

2. Items 1, 3, 4, and 5 described under bald eagles are also applicable to black-footed ferrets.

3. Phillips should maintain contact with the MDFWP non-game biologist in Bozeman to update the status of the black-footed ferret reintroduction plan in Montana and to obtain results of any surveys for white-tailed prairie dogs and ferrets that are conducted in the project area. When or if this species is found to exist in the area, the USFW Endangered Species authorities in Helena must be contacted immediately for instructions regarding new mitigation and avoidance measures. A new BE must then be immediately initiated.

BIOLOGICAL EVALUATION

Grizzly Bear

1. Items 1 through 5 described under bald eagles are also applicable to grizzly bears.

2. Report any sighting of grizzly bears or their sign to the MDFWP non-game biologist in Bozeman and WGFD grizzly bear biologist in Cody and cooperate with existing and revised grizzly bear management programs.

3. All project operations should incorporate the prescribed grizzly bear management precautions for food storage, garbage disposal, and prohibition of dogs and firearms.

Mountain Plover and Long-billed Curlew

If scheduled road construction activities overlap the nesting and pre-fledgling periods for these species (May 1 through July 31), a road-side survey for nesting birds must be conducted prior to the commencement of construction and project use. This survey would be limited to those roads which are ultimately selected and designated as the official access route for this project. If breeding/nesting pairs are found to occur along this route, mitigation measures appropriate to the circumstance and which will safeguard the species will be implemented in consultation with the USFWS (e.g., imposition of time-frame restrictions on road construction and operational road traffic to protect young birds on the road, reduced speed limits in high risk areas, etc.).

Category 2 Candidate Species

1. Items 1 through 5 described under bald eagles and item 3 described under grizzly bears are also applicable to candidate species.

2. Report sightings of any category 2 species to the MDFWP non-game biologist in Bozeman.

DETERMINATION OF EFFECTS

Bald Eagle

Based upon analysis of the proposed action, the current and potential status of the species in the project area, other land use activities in the area, and with incorporation of the coordination/mitigation measures recommended in this report, a determination of "no effect" is concluded for the bald eagle.

Peregrine Falcon

Based upon analysis of the proposed action, the current and potential status of the species in the project area, other land use activities in the area, and with incorporation of the coordination/mitigation measures recommended in this report, a determination of "no effect" is concluded for the peregrine falcon.

Black-Footed Ferret

Based upon analysis of the proposed action, the current and potential status of the species in the project area, other land use activities in the area, and with incorporation of the coordination/mitigation measures recommended in this report, a determination of "no effect" is concluded for the black-footed ferret.

Grizzly Bear

Based upon analysis of the proposed action, the current and potential status of the species in the project area, other land use activities in the area, and with incorporation of the coordination/mitigation measures recommended in this report, a determination of "no effect" is concluded for the grizzly bear.

Mountain Plover and Long-billed Curlew

Based upon analysis of the proposed action, the current and potential status of the species in the project area, other land use activities in the area, and with incorporation of coordination/mitigation measures recommended in this report, a determination of "no effect" is concluded for the mountain plover and the long-billed curlew.

Other Category 2 Candidate Species

Based upon analysis of the proposed action, the current and potential status of the species in the project area, other land use activities in the area, and with incorporation of the coordination/mitigation measures recommended in this report, a determination of "no effect" is concluded for the Swainson's hawk, ferruginous hawk, spotted bat, wolverine, lynx, and Shoshonea.

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FIELD DEVELOPMENT ADDENDUM

To

THREATENED AND ENDANGERED SPECIES

BIOLOGICAL EVALUATION

For

Phillips Petroleum Company
Ruby A Federal No. 1-9
Exploratory Oil/Gas Well

Prepared by:

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Oliver J. Grah
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Sheridan, Wyoming 82801

January, 1990

APPENDIX F

LOCATION AND DESCRIPTION OF FIELD DEVELOPMENT

PROBABILITY OF DISCOVERY

Although other drilling attempts have occurred along the east edge of the Beartooth Plateau and along the Line Creek Plateau along the valley floor, Phillips Ruby A Federal Prospect is the first drilling attempt on the east face of the Line Creek Plateau. This directional drilling attempt is projected to reach a total depth of 12,500 feet, with a true vertical drill depth of 11,600 feet. The targeted proposal is a north-south trending feature, known as the Ruby structure, identified in the subsurface using seismic data that was integrated with limited well control from other drilling attempts in the vicinity.

Phillips' current leasehold in this area is approximately 10,200 acres. The Ruby A Federal Prospect is classified as a wildcat well since it would be drilled in the unproven territory of the Phillips' leasehold. Nationally, during the years 1980 through 1984, approximately 28 percent of all exploratory wells successfully encountered oil and gas (U.S. Energy Information Administration 1984). During the same period, the success rate in Montana was approximately 27 percent. These statistics include all exploration wells and probably overestimate the chance of success for a wildcat well. As a result, there is a high probability that the proposed Ruby A Federal Prospect would not encounter hydrocarbons in producible quantities.

WELL DEVELOPMENT

Phillips proposes to drill the Ruby A Federal Prospect to determine the presence of hydrocarbon reserves and evaluate the commercial potential of the reserves, if encountered, by conducting various tests. Depending on the outcome of the testing program, Phillips may choose to permanently plug the well and abandon the location, temporarily plug or shut-in the well until decisions are reached regarding future production options, or request approval to enter production operations.

As previously mentioned in Chapter 1 of this EIS, the decision to be made by Phillips regarding production from this one exploratory well is related to the amount/type of production encountered and the economic feasibility of producing that product from one well. This determination would be made after all well testing activities are completed and thoroughly analyzed by Phillips. If the decision is made to produce this well, there would be an interim period of no activity at the drill site when Phillips would attempt to obtain a permit to produce from this one exploratory well. The following discussion describes activities associated with producing this one proposed exploratory well.

Oil Well Development

Several steps would be taken to complete or develop the well if it is an oil producer. These steps would occur on the well pad and normally include the following actions: installation and cementing of well casing; perforation of the reservoir; installation of

production tubing; and installation of control heads (an assembly of valves and gauges called a "Christmas Tree") to regulate the rate of flow on flowing wells, or the installation of a pumping unit or other lifting mechanism to lift oil to the surface in a non-flowing well. Equipment off-site would include installation of a battery of tanks for storing the oil and installation of equipment to separate oil, gas, and water so that the oil meets sales requirements. Exhibit F-A1 shows the types and amounts of production equipment normally found at an oil production facility. Segments of the drill pad not needed for production operations would be regraded, topsoiled, and revegetated as per a comprehensive reclamation plan presented in Appendix D of the EIS. Cut and fill slopes associated with drill pad construction would be revegetated. The access road to the drill pad and production facilities would remain in place for maintenance and production development purposes.

Initially, if hydrocarbons were encountered, production from the well would be stored at the production facility in tanks as shown on Exhibit F-A1 and trucked to market facilities. The number of trucks per day would be commensurate with the rate of production encountered. Production operations would require use and maintenance of an access road from the production facility to Montana State Highway 72 on a year long basis. Maintenance during the summer and early fall months would be typical of graveled road maintenance in the area. Maintenance during the winter months would be relative to the amount of production encountered. If production was economically marginal, the well could be shut-in during the winter and monitored periodically by methods approved by the FS/BLM. Should production be sufficient to justify continued winter operations, winter maintenance would include blading or plowing snow from the access road in a manner prescribed in a plan of operations prepared by Phillips and approved by the FS/BLM. Depending on the road use limitations, the well may be shut-in during spring thaw. Exhibit F-A2 shows the transportation system that would likely be used by Phillips for hauling oil from one well.

Based on what Phillips knows of the geology of the area, their targeted formations described in the application for permit to drill (APD), and the negligible quantities of gas encountered during the previous drilling attempts by other companies in the area, Phillips does not expect to encounter gas during the drilling of this exploratory well. If non-producible quantities of gas are encountered (i.e., not economical to produce), with producible quantities of oil, the gas would likely be flared or vented off as authorized by an approved venting or flaring permit issued by the BLM. Because known hydrogen sulfide (H_2S) bearing formations are to be encountered during the exploratory drilling attempt, Phillips has prepared a Contingency and Evacuation Plan (Appendix E) containing safety measures pertaining to accidental release of H_2S during drilling operations.

FIELD DEVELOPMENT

Oil and/or gas field development generally requires more than one well to efficiently extract the hydrocarbon reservoirs. Well density and location are designed to efficiently extract the oil/gas reserves based on specific reservoir characteristics, economics, and environmental considerations. Most of the information required to determine appropriate well density and locations is not available until after the reservoir has been penetrated and production characteristics have been established. After considering all pertinent information, the well density would be subject to the approval of the State of Montana Oil and Gas Conservation Board and the BLM.

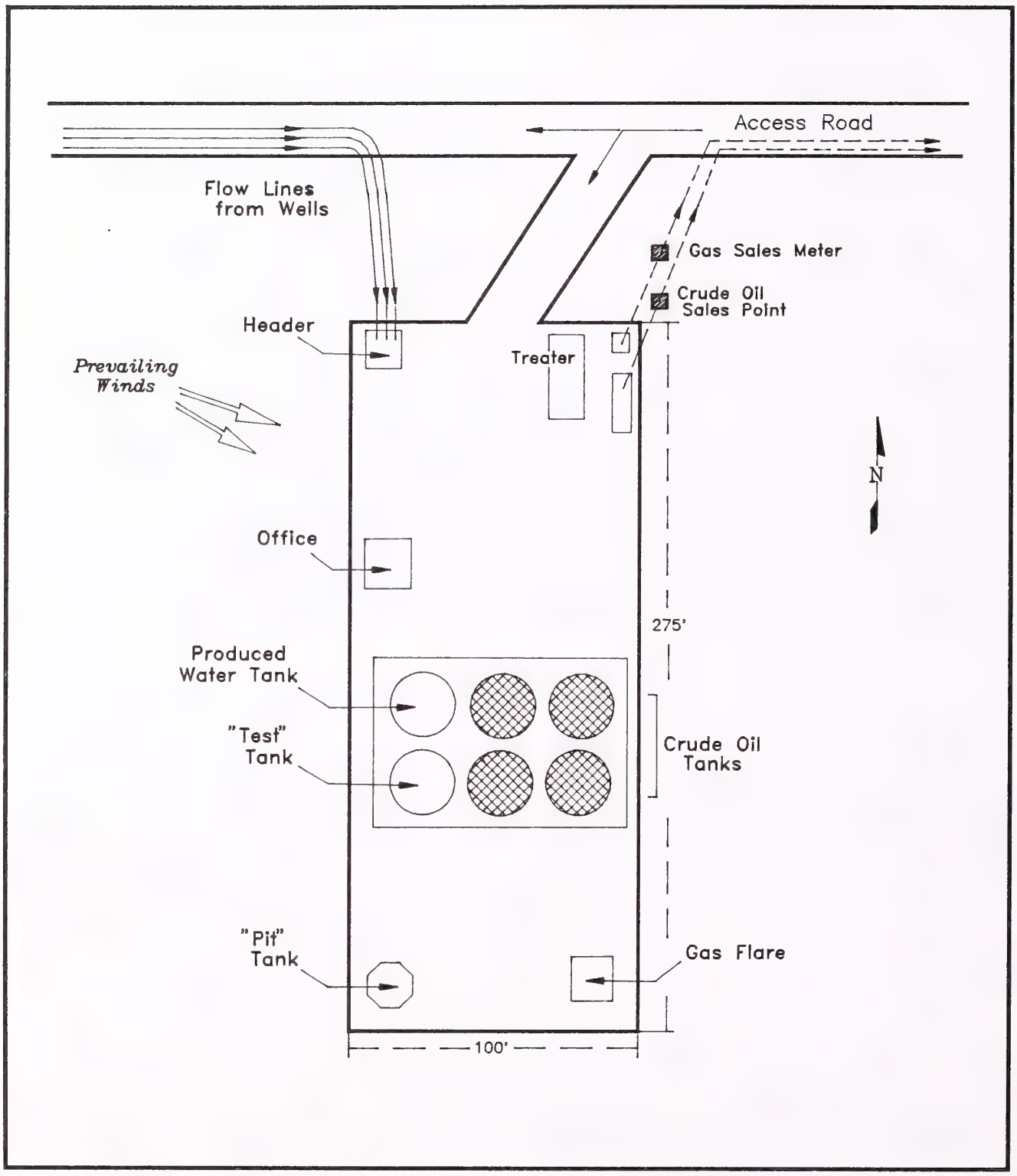

Exhibit F-A1. Schematic of Production Facilities.

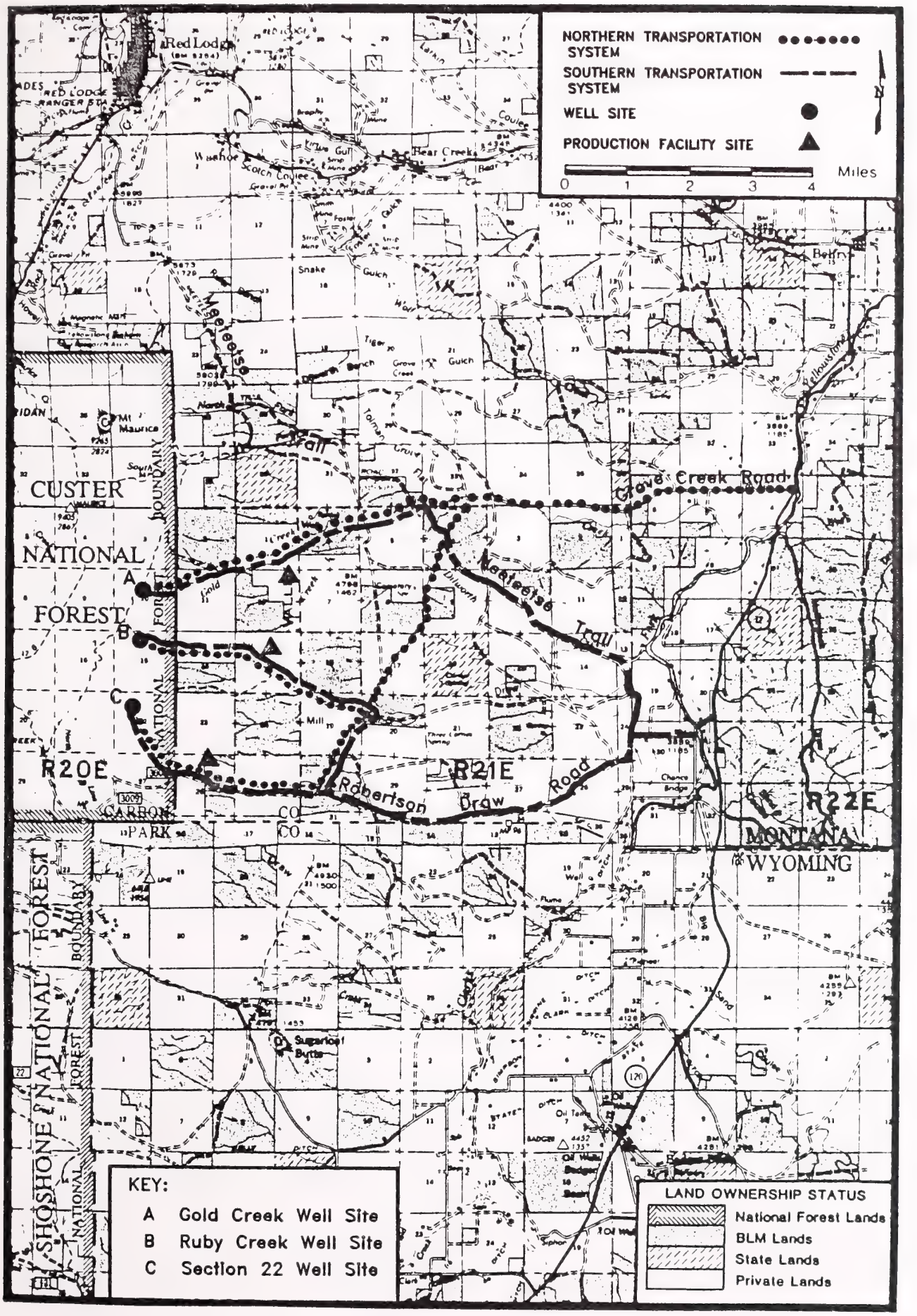

Exhibit F-A2. Potential Transportation Systems for Ruby Field Development.

APPENDIX F

The following discussion regarding development of the Ruby A Federal Prospect is based on what Phillips currently knows of the geology of the Ruby area from seismic interpretations and established well control data from fields to the northeast and southeast of the prospect area.

Only after drilling the prospect will more complete information regarding the geologic structures of interest be known. Once this geologic information is gained, more concrete determinations regarding the intensity and extent of field development would be made by Phillips. If oil or gas is present in commercial quantities, wells would be completed and production equipment and facilities installed. Development activity might be limited to drilling, plugging, and reclaiming disturbances associated with the current drilling proposal or extended to drilling numerous wells from three well sites as shown on Exhibit F-A3, with their attendant tank batteries, electric lines, and access roads.

The three proposed well sites are located such that Phillips should be able to reach and develop 80 percent of the leasehold. Because of the structure being drilled and drill site vertical and horizontal displacement limitations described in Section 2.2.3 of the EIS, all three well sites would be located on the Custer National Forest. As discussed in Chapter 2 of this EIS, directionally drilling the Ruby Prospect requires a high vertical elevation location and a limited horizontal distance to the downhole drilling target. The higher elevation allows the vertical space needed to achieve changes in direction for the drill bit. The horizontal distance from the wellbore to the target must be as short as possible to minimize the angle needed to reach the target. Phillips estimates that moving off-Forest would limit the potential development of these leases to less than 30 percent using conventional directional drilling methods.

Aspects of the field development as currently envisioned by Phillips include the following:

- Confirmation Well - If the initial exploratory well encountered hydrocarbons (either gas or oil), an additional exploratory well, called a confirmation well, would likely be drilled to confirm the findings. This well would be drilled from a drill site location approved through the NEPA process. The confirmation well would be directionally drilled to test the extent of the geologic structure in another direction. This well would also help evaluate the hydrocarbon potential of the structure.

- Production Wells - The steep topography of the east face of the Line Creek Plateau and the perceived location of the geologic structure limits the number of suitable well site locations available for field development. As a result, as many wells as feasible would be drilled from each of the three well sites. Phillips estimates that a maximum of six directional production wells could be drilled from each well site, for a maximum of 18 producing wells within the field. Phillips would attempt to complete one production well annually on each of the well sites, for total well development in six years. This figure would assume few drilling and completion problems. Phillips estimates a range of six to ten years to complete the wells, with allowance for drilling and completion problems. The actual number of wells that can be expected from each well site would be better known following evaluation of the original test well and the confirmation well. Each well site would be equipped with one well head for each producing well

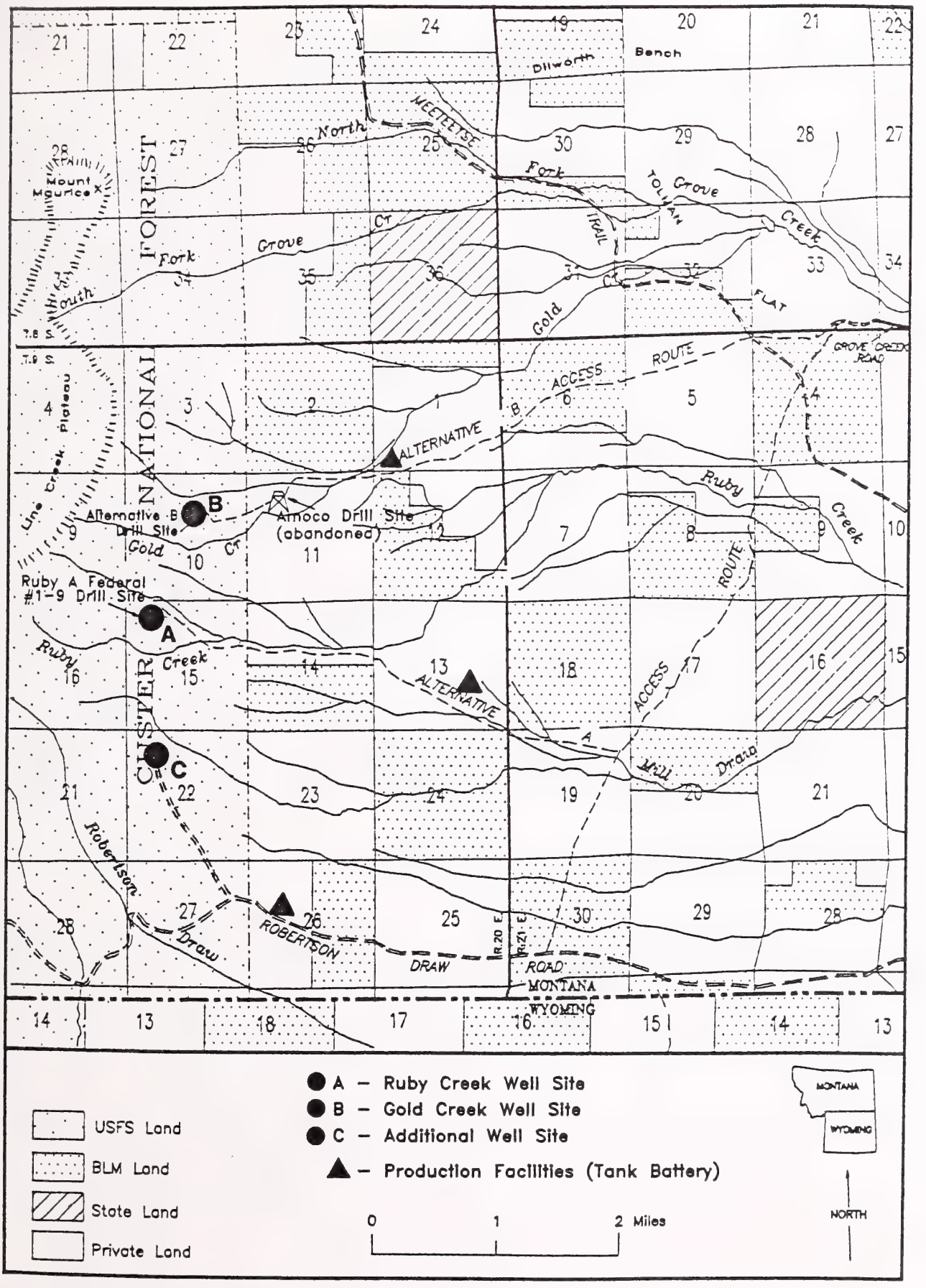

Exhibit F-A3. Ruby A Federal Field Development Facilities.

and surface piping as needed to operate the method of well pumping utilized. Phillips currently plans to use hydraulic well pumps. These pumps were selected because they are unobtrusive, quiet, and operate on produced oil.

- Production Facilities - One off-site production facility is anticipated for each well site and would be located up to three miles from the well site. Proposed locations of the production facilities are shown on Exhibit F-A3. Phillips has proposed off-site production facilities to reduce the frequency of visits required to each well site for monitoring and maintenance purposes. Well visits for servicing operations would occur weekly during the winter and spring months. During the summer and fall months, wells may be visited more frequently. The use of automatic shutdown systems and well control from the remote production facilities would preclude the need for daily visits. Well sites would be accessed from the production facilities by enclosed motor vehicle during the winter months. Access roads to the production facilities and the producing well sites would remain open year-round.

  The production facilities would require electrical power, continual access, and numerous pieces of production equipment as described above. Electricity would be brought in to the production facilities either from the north or south by tying into existing power sources. Powerline corridors from existing power sources to the production facilities would likely follow the potential transportation systems shown on Exhibit F-A2. Power poles would be designed so as to preclude the possibility of electrocuting raptors. Electricity would be located underground from the production facilities to the well pads.

  Phillips plans to install all flowlines, power, oil/lift gas, instrument gas, electricity, and heating lines underground in the access road corridor, as needed, to operate the well pads remotely. The number, size, and use of these lines would be determined by the characteristics of the hydrocarbon being produced. Characteristics and behavior of the hydrocarbon reservoir may make necessary changes from one production method to another over the life of the field.

- Pipeline/Transportation - Pipelines for fluids from the wells would be laid to the production facilities using the existing road right-of-way from the well pad. Selection of pipeline routes from the production facilities to a tie-in with existing pipeline(s) would depend on the product destination (i.e., the purchaser of the product). There are several existing underground pipelines that could be utilized, located approximately 12 to 15 miles to the east of the Ruby A Federal field and generally parallel Wyoming Highway 120 and Montana Highway 72.

Crude oil from the production facilities would be transported to market by pipeline if the volumes produced are large enough to justify the expense of laying the lines. If this justification cannot be made, crude oil would be hauled from the production facilities by tanker trucks and transported to a truck unloading depot where the crude oil would be unloaded into a pipeline leading to a larger interstate pipeline. Production amounts would be monitored by means of a Lease Automated Custody Transfer unit (LACT).

ENVIRONMENTAL REVIEW

Discovery of commercial quantities of oil and/or gas reserves would likely lead to additional proposals for oil and/or gas development within the Phillips leasehold. If the Ruby A Federal Prospect is drilled and commercial quantities of oil and/or gas are found, BLM and FS regulations require that Phillips prepare a conceptual field development plan and submit this plan prior to further development. The field development plan would describe the extent, location, duration, and timing of additional wells and other facilities required for development of the field. The plan would be based on the findings of the Ruby A Federal Prospect and would be restricted to specific activities or facilities needed to further explore or produce hydrocarbon products from the Phillips' leasehold.

Once Phillips submits a conceptual field development proposed, the BLM and FS would complete an analysis of all aspects of it and prepare the appropriate environmental document (either an EA or an EIS). As required by the National Environmental Policy Act (NEPA), the environmental review would include a formal process for identifying public and agency concerns regarding the development activities (including consultation with the USFWS). The environmental analysis would specifically address the potential environmental impacts of the proposed field development activities and feasible alternatives. The analysis would be distributed for public, state, and federal agency review and comment. All comments received would be considered in the BLM and FS decision-making process.

Any proposed field development activities in Phillips' leasehold would also be subject to the permitting processes of the State of Montana. Depending on the nature and extent of the conceptual field development plan, field development activities may require additional or concurrent state environmental review under rules applicable in Montana. All federal and state requirements would be coordinated.

FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES

Federally listed threatened and endangered (T & E) species and Category 2 Candidate species of birds, mammals, and plants that might occur on or near the field development area, or which may be potentially affected by the activities are listed the same as those listed in the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site and are listed below. Four species have been designated as T & E by the Endangered Species Act of 1973, and as amended. Eight species are designated by the USFWS as Category 2 species (USFWS 1985; Taylor 1989). A Category 2 indicates that there is insufficient data available to determine if the species should be recommended for proposal for federal listing. These species are listed below:

Threatened and Endangered Species:

Bald Eagle	*Haliacetus leuccephalus*	Endangered
Peregrine Falcon	*Falco peregrinus*	Endangered
Black-footed Ferret	*Mustela nigripes*	Endangered
Grizzly Bear	*Ursus arctos horribilis*	Threatened

Category 2 Species:

Swainson's Hawk	*Buteo swainsoni*	Summer resident
Ferruginous Hawk	*Buteo regalis*	Summer resident
Mountain Plover	*Charadrius montanus*	Summer resident
Long-Billed Curlew	*Numenius americanus*	Summer resident
Spotted Bat	*Euderma maculatum*	Possible resident
N. Amer. Wolverine	*Gulo gulo luscus*	Resident
North American Lynx	*Felis lynx canadensis*	Resident
Shoshonea	*Shoshonea pulvinata*	Closest Occurrence 3 mi NNE

There is no documentation of the regular occurrence of any T & E species or Category 2 species in the field development area or along any of the access alternatives (project area). However, some of the species listed above are known to occur occasionally, or have the potential to occur, within the vicinity of the proposed project area. The likelihood of such occurrences is considered in the following text.

HABITAT USE AND STATUS OF SPECIES

Threatened and Endangered Species

Bald Eagle

The habitat use and status of the bald eagle is identical to that described in the Habitat Use and Status of Species section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site.

Peregrine Falcon

The habitat use and status of the peregrine falcon is identical to that described in the Habitat Use and Status of Species section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site.

Black-Footed Ferret

The habitat use and status of the black-footed ferret is identical to that described in the Habitat Use and Status of Species section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site.

Grizzly Bear

The habitat use and status of the grizzly bear is identical to that described in the Habitat Use and Status of Species section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site.

Category 2 Candidate Species

Swainson's Hawk

The habitat use and status of the Swainson's Hawk is identical to that described in the Habitat Use and Status of Species section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site.

Ferruginous Hawk

The habitat use and status of the Ferruginous Hawk is identical to that described in the Habitat Use and Status of Species section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site.

Mountain Plover

The habitat use and status of the Mountain Plover is identical to that described in the Habitat Use and Status of Species section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site.

Long-Billed Curlew

The habitat use and status of the long-billed curlew is identical to that described in the Habitat Use and Status of Species section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site. In addition, it is known that this species at least migrates through the area adjacent to one of the proposed access routes (Robertson Draw Road) as one individual was sighted there during the spring of 1989 (Stewart 1989).

Spotted Bat

The habitat use and status of the spotted bat is identical to that described in the Habitat Use and Status of Species section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site.

North American Wolverine

The habitat use and status of the North American wolverine is identical to that described in the Habitat Use and Status of Species section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site.

North American Lynx

The habitat use and status of the North American lynx is identical to that described in the Habitat Use and Status of Species section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site.

Shoshonea

The description of Shoshonea presented in the Biological Evaluation also applies to this section.

APPENDIX F

METHODS

Methods used in compiling this addendum are identical to those employed for the Methods Section in the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site.

EFFECTS OF THE PROPOSED ACTION

Direct and Indirect Impacts

Bald Eagle

All of the impacts described for the bald eagle in the Direct and Indirect Impact Section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site apply equally to this analysis. Because of the additional roads and vehicular traffic associated with field development, it is likely that the potential of impacts from vehicle collisions with eagles feeding on road-killed carrion will increase. It is also likely that the potential for possible toxicological impacts from an accidental spill or discharge of petroleum products or associated chemicals will increase. The potential for electrocution will increase unless power lines are buried or above-ground lines are designed to make eagle electrocution impossible.

Peregrine Falcon

All of the impacts described for the peregrine falcon in the Direct and Indirect Impact Section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site apply equally to this analysis. No additional impacts due to field development activities are anticipated.

Black-Footed Ferret

All of the impacts described for the black-footed ferret in the Direct and Indirect Impact Section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site apply equally to this analysis. No additional impacts due to field development activities are anticipated.

Grizzly Bear

All of the impacts described for the grizzly bear in the Direct and Indirect Impact Section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site apply equally to this analysis. No additional impacts due to field development activities are anticipated.

Swainson's Hawk

All of the impacts described for the Swainson's Hawk in the Direct and Indirect Impact Section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site apply equally to this analysis. The potential for electrocution of migrating hawks

might increase unless power lines are buried or above-ground lines are designed to make raptor electrocution impossible. No further impacts due to field development activities are anticipated.

Ferruginous Hawk

All of the impacts described for the Ferruginous Hawk in the Direct and Indirect Impact Section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site apply equally to this analysis. The potential for electrocution of migrating hawks might increase unless power lines are buried or above-ground lines are designed to make raptor electrocution impossible. No further impacts due to field development activities are anticipated.

Mountain Plover and Long-Billed Curlew

All of the impacts described for mountain plovers and long-billed curlews in the Direct and Indirect Impact Section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site apply equally to this analysis. Because of the additional roads and vehicular traffic associated with field development, it is likely that the potential of impacts from vehicle collisions with these species will be increased, if in fact breeding and nesting occurs in the area.

Spotted Bat

All of the impacts described for the spotted bat in the Direct and Indirect Impact Section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site apply equally to this analysis. No further impacts due to field development activities are anticipated.

North American Wolverine

All of the impacts described for the wolverine in the Direct and Indirect Impact Section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site apply equally to this analysis. Although the probability of wolverine occurring within the project area is remote, the continuation of field development activities throughout the winter, and the increase in the traffic and number of miles of road traversed will increase the possibility of striking one of these animals on the road. The existence of plowed roads, which are open to the public during the winter months, may also facilitate access of poachers to areas where this species might be illegally harvested.

North American Lynx

All of the impacts described for the lynx in the Direct and Indirect Impact Section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site apply equally to this analysis. Although the probability of lynx occurring within the project area is remote, the continuation of field development activities throughout the winter, and the increase in the traffic and number of miles of road traversed will increase the possibility of striking one of these animals on the road. The existence of plowed roads, which are open to the public during the winter months, may also facilitate access of poachers to areas where this species might be illegally harvested.

Shoshonea

Existing information on suitable habitat exploited by the species and its distribution indicates that most of the reasonable foreseeable field development would not effect the plant. Construction of new road to the well site in Sec 22 as well as construction of the site could effect the plant. *Surveys conducted in July, 1989 revealed no habitat or occurrence of Shoshonea at the various components and facilities considered for development.*

CUMULATIVE EFFECTS

Cumulative effects produced by field development include those described in the Cumulative Effects Section in the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site. Additional effects are described below.

The simultaneous development, operation, and production of three drill sites would increase the likelihood of increasing the magnitude of several potential impacts beyond those expected from the drilling and operation of a single well, and would also create several new ones. New impacts include: (1) an extension of total area exposed to potential impacts because of activities that are dispersed across multiple sites, (2) an extension of the total time period over which potential impacts may occur (e.g. all year for multiple-year time periods vs. June 15-November 15 over a two-year time period), (3) an increase in the number and kind of human activities to which wildlife species will be exposed, (4) potential negative effects associated with the translocation of petroleum products off the well sites and out of the area, and (5) the potential for accidental spill or discharge of petroleum or other chemical products. Periodic human activities will continue on the well sites throughout the year.

IMPACTS SUMMARY

Impacts produced by field development are identical to those described in the Impacts Summary Section in the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site.

COORDINATION MEASURES

Bald Eagle

All of the measures described for the bald eagle in the Coordination Measures Section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site apply equally to this analysis. In addition, power lines installed to service operations should either be buried underground or suspended from poles in configurations that make raptor electrocution impossible.

Peregrine Falcon

All of the measures described for the peregrine falcon in the Coordination Measures Section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill

Site apply equally to this analysis. In addition, power lines installed to service operations should either be buried underground or suspended from poles in configurations that make raptor electrocution impossible.

Black-Footed Ferret

All of the measures described for the black-footed ferret in the Coordination Measures Section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site apply equally to this analysis. No additional measures are recommended at this time.

Grizzly Bear

All of the measures described for the grizzly bear in the Coordination Measures Section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site apply equally to this analysis. No additional measures are recommended at this time.

Mountain Plover and Long-Billed Curlew

All of the measures described for mountain plover and long-billed curlew in the Coordination Measures Section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site apply equally to this analysis. No additional measures are recommended at this time.

Other Category 2 Candidate Species

All of the measures described for Other Category 2 Candidate Species in the Coordination Measures Section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site apply equally to this analysis. No additional measures are recommended at this time.

DETERMINATION OF EFFECTS

Bald Eagle

Based upon analysis of the proposed action, the current and potential status of the species in the project area, other land use activities in the area, and with the incorporation of the coordination/mitigation measures recommended in this report, a determination of "no effect" is concluded for the bald eagle.

Peregrine Falcon

Based upon analysis of the proposed action, the current and potential status of the species in the project area, other land use activities in the area, and with the incorporation of the coordination/mitigation measures recommended in this report, a determination of "no effect" is concluded for the peregrine falcon.

Black-Footed Ferret

Based upon analysis of the proposed action, the current and potential status of the species in the project area, other land use activities in the area, and with the incorporation of the coordination/mitigation measures recommended in this report, a determination of "no effect" is concluded for the black-footed ferret.

Grizzly Bear

Based upon analysis of the proposed action, the current and potential status of the species in the project area, other land use activities in the area, and with the incorporation of the coordination/mitigation measures recommended in this report, a determination of "no effect" is concluded for the grizzly bear.

Mountain Plover and Long-Billed Curlew

Based upon analysis of the proposed action, the current and potential status of the species in the project area, other land use activities in the area, and with the incorporation of the coordination/mitigation measures recommended in this report, a determination of "no effect" is concluded for the mountain plover and long-billed curlew.

Other Category 2 Candidate Species

Based upon analysis of the proposed action, the current and potential status of the species in the project area, other land use activities in the area, and with the incorporation of the coordination/mitigation measures recommended in this report, a determination of "no effect" is concluded for the Swainson's Hawk, ferruginous hawk, spotted bat, wolverine, lynx, and shoshonea.

REFERENCES

References are the same as those listed in the References Section of the Biological Evaluation for the Ruby A Federal No. 1-9 Exploratory Drill Site.

APPENDIX G

Directional Drilling Analysis

APPENDIX G

Directional Drilling Analysis

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APPENDIX G

Directional Drilling Analysis of the Proposed Ruby A Federal No. 1-9 Drill Site and A Variation Drill Site Immediately to the East

PURPOSE

The purpose of this analysis is to (1) discuss the feasibility of drilling the subject well from an alternative location located to the east and below the saddle from which the proposed Ruby A Federal No. 1-9 drill site is located and (2) to provide further understanding of the considerations required in the site selection for a directional well.

INTRODUCTION

During the FS and BLM review of the draft Ruby A Federal 1-9 EIS, questions concerning the need for an evaluation of an alternate drill site location east of the proposed Ruby drill site location prompted Phillips to provide a detailed analysis of this alternate site as compared to the proposed site. A discussion of the factors that were considered in the site selection are addressed in this analysis.

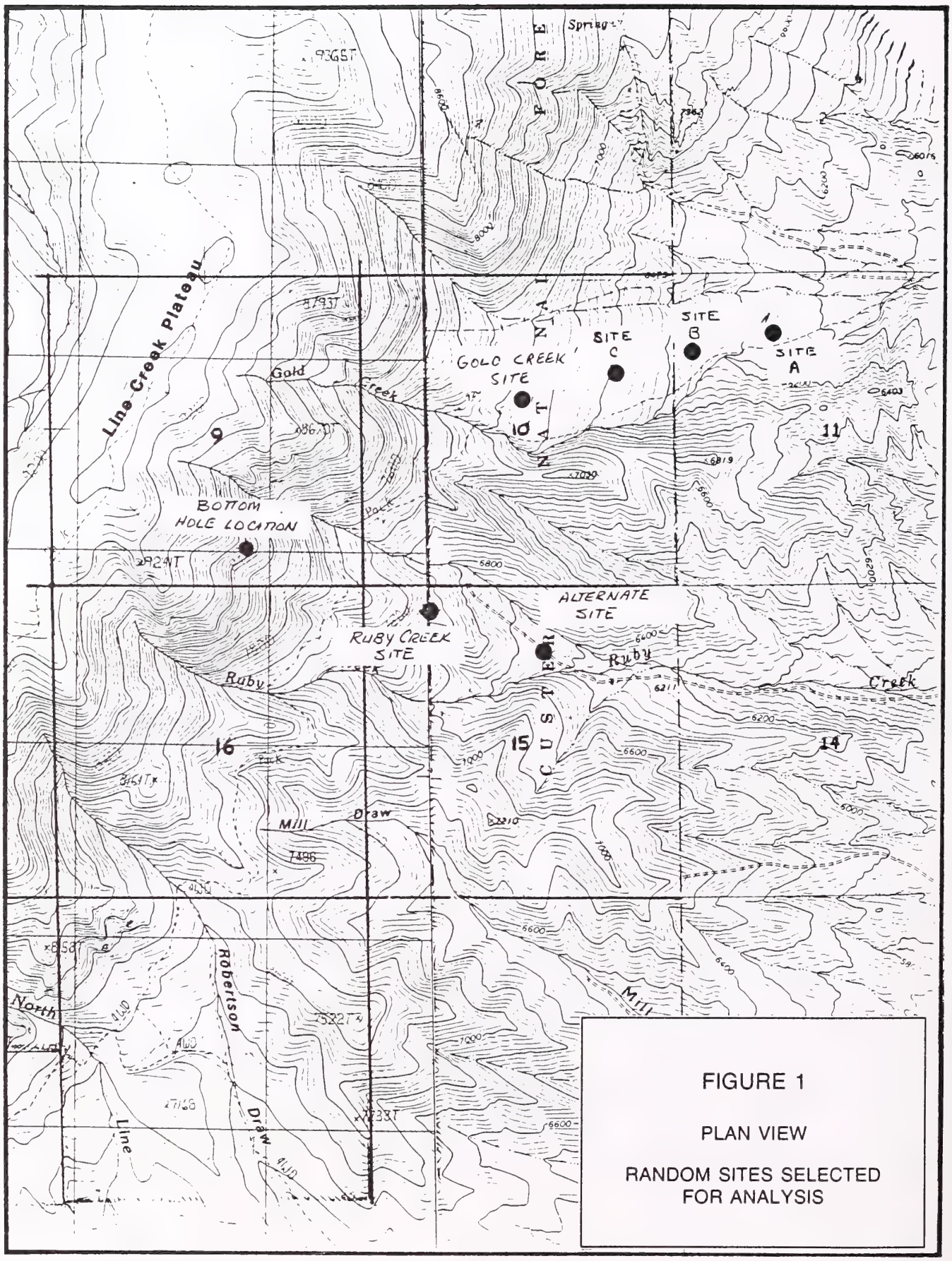
PROJECT SUMMARY

Phillips' original plans to drill the Ruby A Federal 1-9 well vertically from a drill site location on the top of the Line Creek Plateau were met with public opposition because of the perceived environmental sensitivity of the Line Creek Plateau. During this time, modifications in the seismic interpretation were made, moving the desired geologic target to the southeast.

As a result of the public concerns and the modified seismic interpretations, an investigation was initiated to locate a suitable location that would minimize impacts to the environment and allow Phillips to obtain a successful evaluation of the geologic objectives. In order to meet both objectives, a directional well would be required.

Several potential sites were selected based on topography and analyzed for feasibility beginning with sites located east of the Custer National Forest Boundary that provided minimum environmental impact. Successive sites were selected progressing to the west until the proposed Ruby A 1-9 drill site was selected. Each of the previous sites to the east, when analyzed, were eliminated due to the excessively high angle required in combination with the abrupt turn required to build the angle and the abrupt turn required to return the angle to vertical. These characteristics are illustrated in Figures 1 and 2 and result from the increased distance from the geologic objective in conjunction with the decrease in the vertical relief.

APPENDIX G


Line Creek Plateau
Gold Creek
GOLD CREEK SITE
SITE C
SITE B
SITE A
BOTTOM HOLE LOCATION
RUBY CREEK SITE
ALTERNATE SITE
Ruby Creek
Mill Draw
Robertson Draw
North Fork
Line Creek
9
10
11
14
15
16
FIGURE 1
PLAN VIEW
RANDOM SITES SELECTED FOR ANALYSIS

DIRECTIONAL DRILLING ANALYSIS

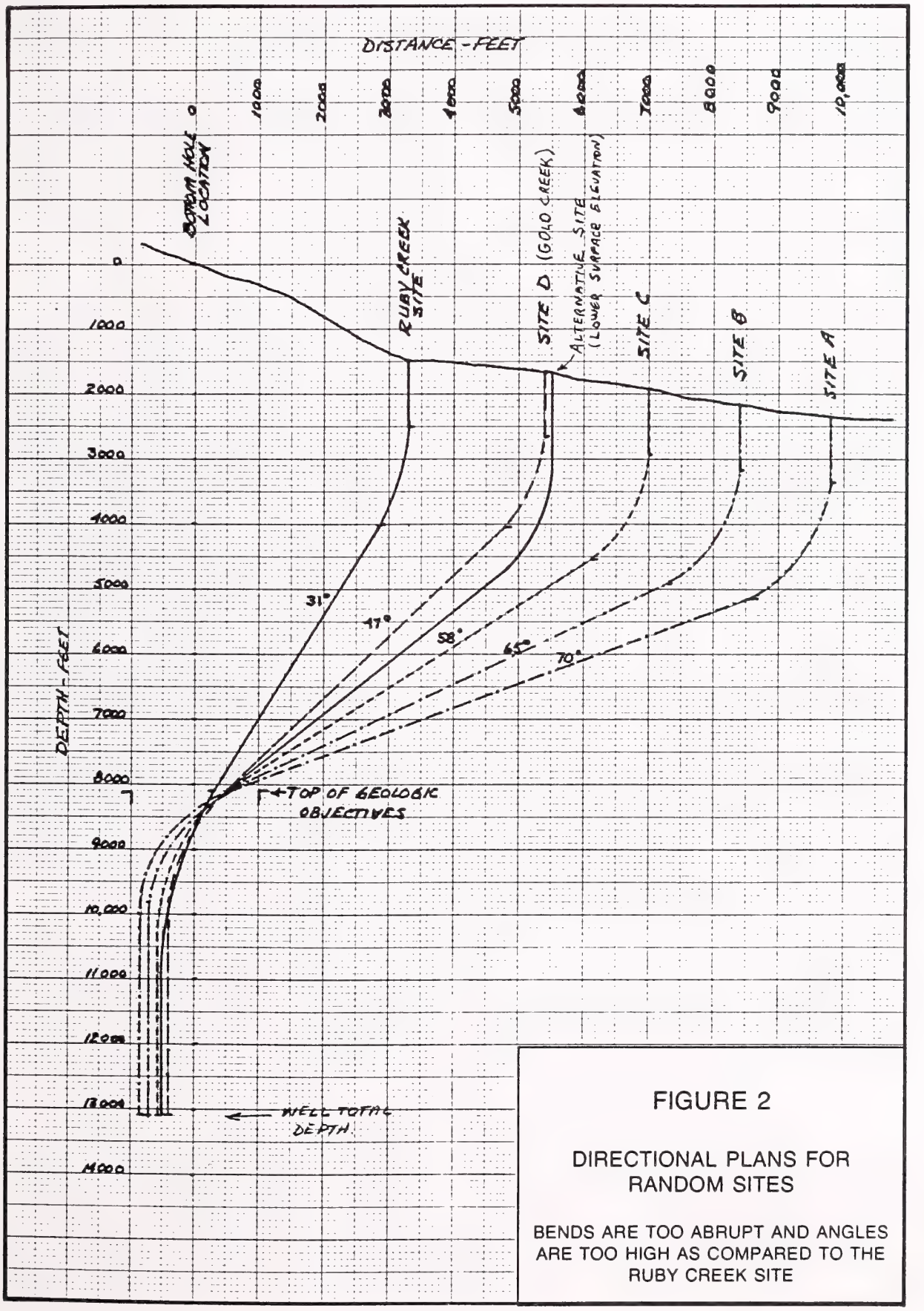


FIGURE 2

DIRECTIONAL PLANS FOR RANDOM SITES

BENDS ARE TOO ABRUPT AND ANGLES ARE TOO HIGH AS COMPARED TO THE RUBY CREEK SITE

The sites located furthest to the east were eliminated due to the excessive angle and abrupt turns required to build and drop the angle. These factors alone were sufficient to determine the sites to be technically unfeasible.

As the potential sites progressed nearer to the proposed Ruby A Federal No. 1-9 drill site, additional factors had to be considered which were critical in selection of the proposed site.

These additional factors applied to every site that was evaluated and also apply to the easterly alternative in question.

CONCLUSIONS

1. The geologic objectives require drilling an 'S'-shaped curve, considered to be the most difficult directional plan.

2. The alternate location is approximately 500' lower in elevation and an additional 2100' further away from the required bottom hole location as compared to the Ruby Creek Site.

3. The minimum possible angle required from the alternate location is 51 degrees or a 20 degree increase in angle compared to a 31 degree angle requirement for the Ruby Creek Site.

4. The abruptness or tightness of the bends necessary to obtain the required angle and also return again to vertical from the alternate location is higher, resulting in sharper turns.

5. The high angle required from the alternate site would require crossing faults at low angles. This increases the probability of the drill hole running along the faults and not being able to drill through the faults to the objective formations.

6. Exposure time in the problem "Cody Shale" will be increased due to the higher angle required from the alternate location.

7. The alternate location will require building the angle in a complex faulted area, as indicated by the USGS and as determined by surface geology and seismic interpretations, increasing the difficulty in building and holding the required angle and direction required to reach the objective.

GEOLOGIC OBJECTIVES

The purpose of drilling the well is to evaluate the lower geologic formations to determine the presence of oil and gas. Based on the current data available, the proposed bottom hole location was selected as having the highest potential for oil and gas as the formations are located on the structural high at this location. The formations of interest are the Frontier, Lower Cretaceous, Permian/Pennsylvanian, Mississippian/Devonian, and the Ordovician.

DIRECTIONAL DRILLING ANALYSIS

DIRECTIONAL PATTERN

Three basic patterns exist in drilling directional wells as shown in Figure 3. Because of the need to penetrate a number of formations at a given point (the structural high), the Type II pattern is required. This pattern is considered to be the most difficult as two bends are required as opposed to one bend required for the Type I and III patterns.

TORQUE AND DRAG

As a bend is created to build the angle, the torque or twisting in the drill string required for drilling is increased, creating additional stresses on the drill string. Each additional bend created increases this torque. If the torque becomes excessive, failures in the drill string can result. If the bend is made too abruptly, the torque will also increase significantly.

Another concern when creating the bends is excessive drag. Drag is the additional pull that is required above the weight of the drill string to retrieve the drill string from the hole. Drag is created by the friction of the drill string against the wall of the hole. When the bend created is gradual, the drill string is flexible enough to move through without much difficulty. When the bend is abrupt, the drill string cannot be moved as easily through the bend and, if too abrupt, the drill string can become stuck in the hole. Each additional bend made will create additional drag.

Therefore, it is important to minimize the number of bends and, when required, create or build the bends as gradually as possible.

Torque and drag also increase as the angle of the well is increased. This is caused by the drill string laying against the wall of the hole. As the angle of the hole is increased, the friction is increased between the hole wall and drill string due to gravity. This, in turn, increases the torque and drag.

GEOLOGIC CONSIDERATIONS

When planning a directional well, consideration must be given to the subsurface geology as geologic characteristics of formations and faults have a significant effect on the angle and direction of the well. Surface locations must be selected to utilize the natural formation deviation tendencies to successfully drill the well.

Formation Deviation Tendencies

When drilling through alternating hard and soft formations and faults, the course of the well will exhibit a tendency towards drilling perpendicular to the bedding plane of the formations or the fault plane unless the angle at which the drill hole comes in contact with the formations is too low, in which case the drill hole will tend to run along the bedding plane (Figure 4).

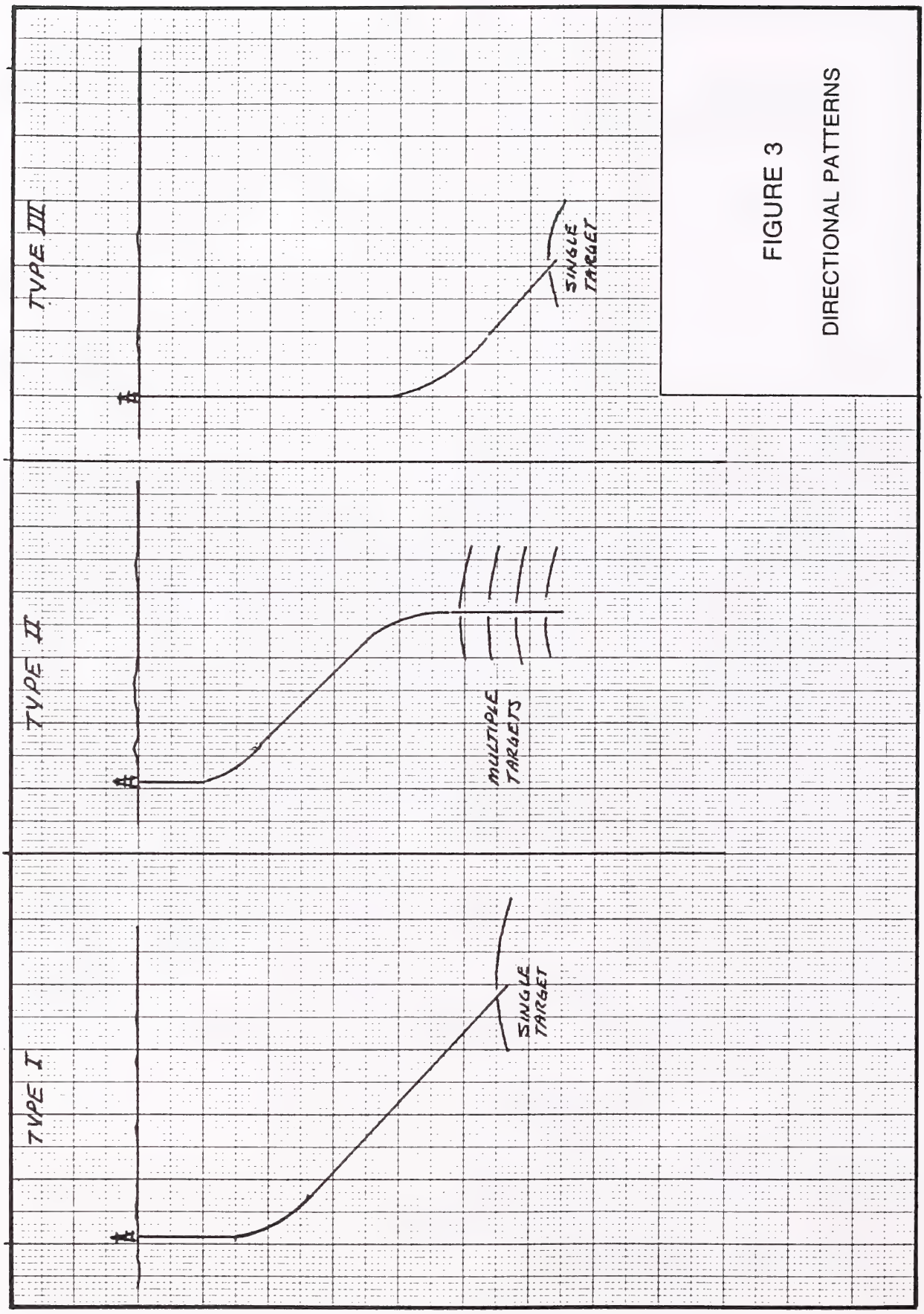


FIGURE 3

DIRECTIONAL PATTERNS

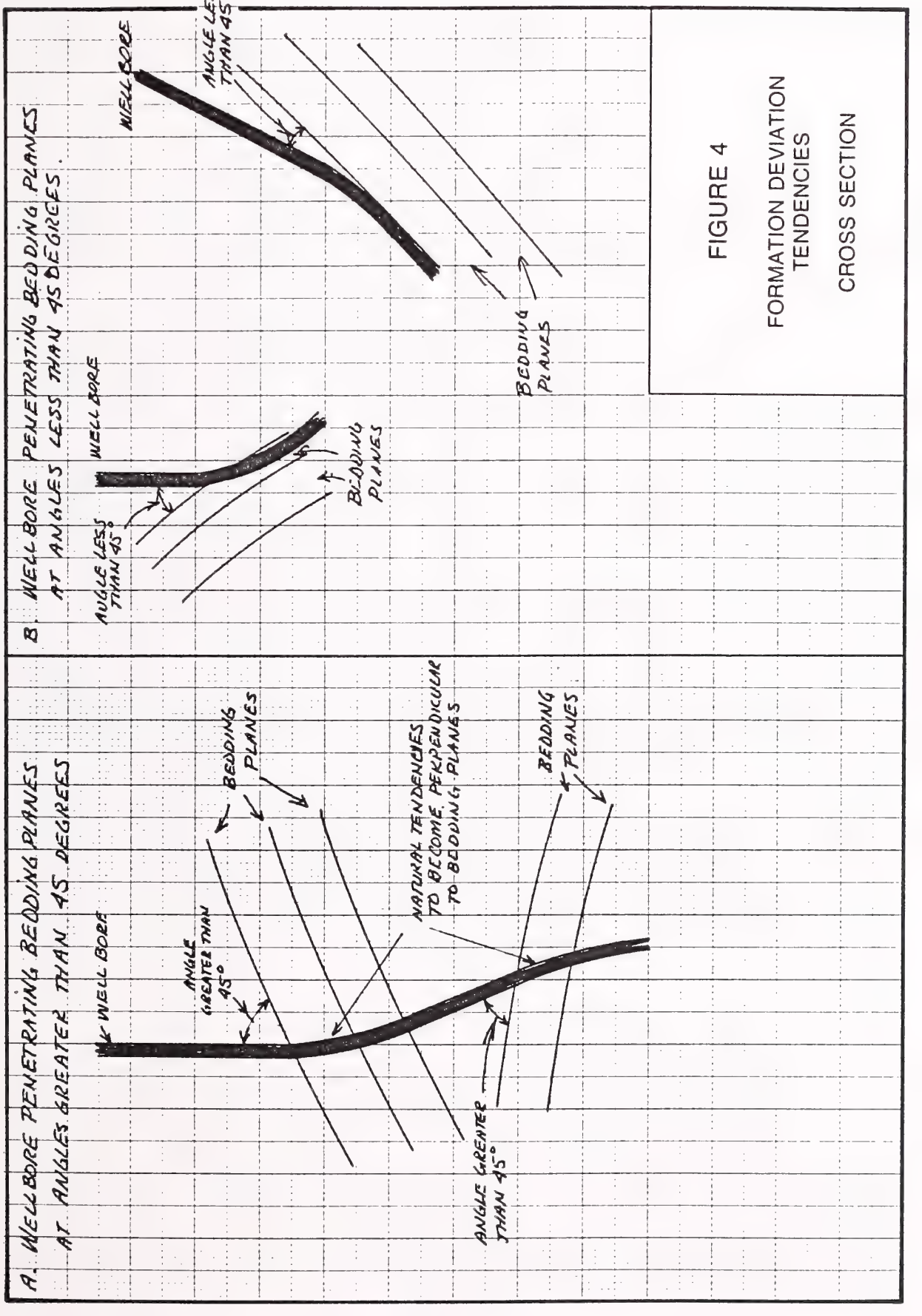

A. WELLBORE PENETRATING BEDDING PLANES AT ANGLES GREATER THAN 45 DEGREES
WELL BORE
ANGLE GREATER THAN 45°
BEDDING PLANES
NATURAL TENDENCIES TO BECOME PERPENDICULAR TO BEDDING PLANES
BEDDING PLANES
ANGLE GRENTER THAN 45°
B. WELL BORE PENETRATING BEDDING PLANES AT ANGLES LESS THAN 45 DEGREES.
WELL BORE
ANGLE LESS THAN 45°
BEDDING PLANES
WELL BORE
ANGLE LESS THAN 45°
BEDDING PLANES

FIGURE 4

FORMATION DEVIATION TENDENCIES

CROSS SECTION

These same tendencies also hold true for directional control (Figure 5). Because the attitude or trends of the geologic formations run in a southwest to northeast direction, parallel to the Line Creek Plateau (Figure 6), the Ruby Creek Site would allow the drill hole to intersect the formation attitude near perpendicular. This will allow the greater directional control required to reach the bottom hole location.

Problem Formations

During the drilling phase of this well, it is anticipated to encounter the Cody Shale Formation which is known to create difficult drilling problems. Due to the overturned nature of the geology, the Cody Shale is expected to occur twice, first in the overturned section, then again in the upper Cretaceous section above the Frontier.

The thickness of the Cody Shale is expected to exceed 600'. The Cody Shale is a difficult formation to drill as it contains clays that tend to swell when coming in contact with drilling mud. In addition to the high clay content, the shales will have a tendency to slough or fall in while drilling. The swelling clays will cause the drill hole to become "tight" as the hole diameter reduces from the swelling. Sloughing shales occur when the wall of the drill hole contains unconsolidated or loose sand layers that erode away during drilling. The shales become unstable and fall off into the hole. These tendencies can cause the drill string to become stuck in the wellbore and extreme caution must be used when drilling this section.

These problems can be controlled to some extent by maintaining or adjusting the drilling mud properties, however, excessive exposure of the formation to the drilling mud will cause the drill hole through the shale section to become unstable, resulting in severe problems.

The best method to minimize problems through the Cody Shale is to reduce the exposure time of the drilling mud to the formation and run a protective length of casing across the formation, prior to drilling deeper.

Minimizing the exposure time can be accomplished best by drilling through the section as close to vertical as possible. Figure 7 shows how exposure is increased as the angle of the well increases. With the higher angle, more of the formation has to be drilled. This increases the exposure time of this formation. In addition to the greater length of formation drilled, the previously mentioned difficulties associated with the higher angle holes will result in slower drilling, further increasing the exposure time and problems.

ANALYSIS OF THE ALTERNATE LOCATION

This location is located approximately 2100 feet east and below the saddle, from where the Ruby Creek site is located. Surface elevation of the alternate is 6500 feet, or 500 feet lower in elevation.

Figure 8 illustrates the directional plan that would be required to meet the geologic objectives versus the proposed Ruby Creek site. As indicated, compared to the Ruby Creek site, the following disadvantages are noted for the alternate site:

A. NATURAL TENDENCY OF WELL BORE TO ORIENT OR. CHANGE DIRECTION WHEN INTERSECTING FORMATION ATTITUDE AT AN ANGLE GREATER THAN 45 DEGREES
FORMATION ATTITUDE
PERPENDICULAR LINE TO ATTITUDE
SURFACE LOCATION
ANGLE GREATER THAN 45°
BOTTOM HOLE LOCATION
NATURAL TENDENCY OF WELL BORE
B. NATURAL TENDENCY OF WELL BORE TO CHANGE DIRECTION WHEN INTERSECTING FORMATION ATTITUDE AT AN ANGLE LESS THAN 45 DEGREES.
ANGLE LESS THAN 45°
SURFACE LOCATION
FORMATION ATTITUDE
PLANNED COURSE
BOTTOM HOLE LOCATION
NATURAL TENDENCY OF WELLBORE
FIGURE 5
FORMATION DIRECTIONAL TENDENCIES
PLAN VIEW

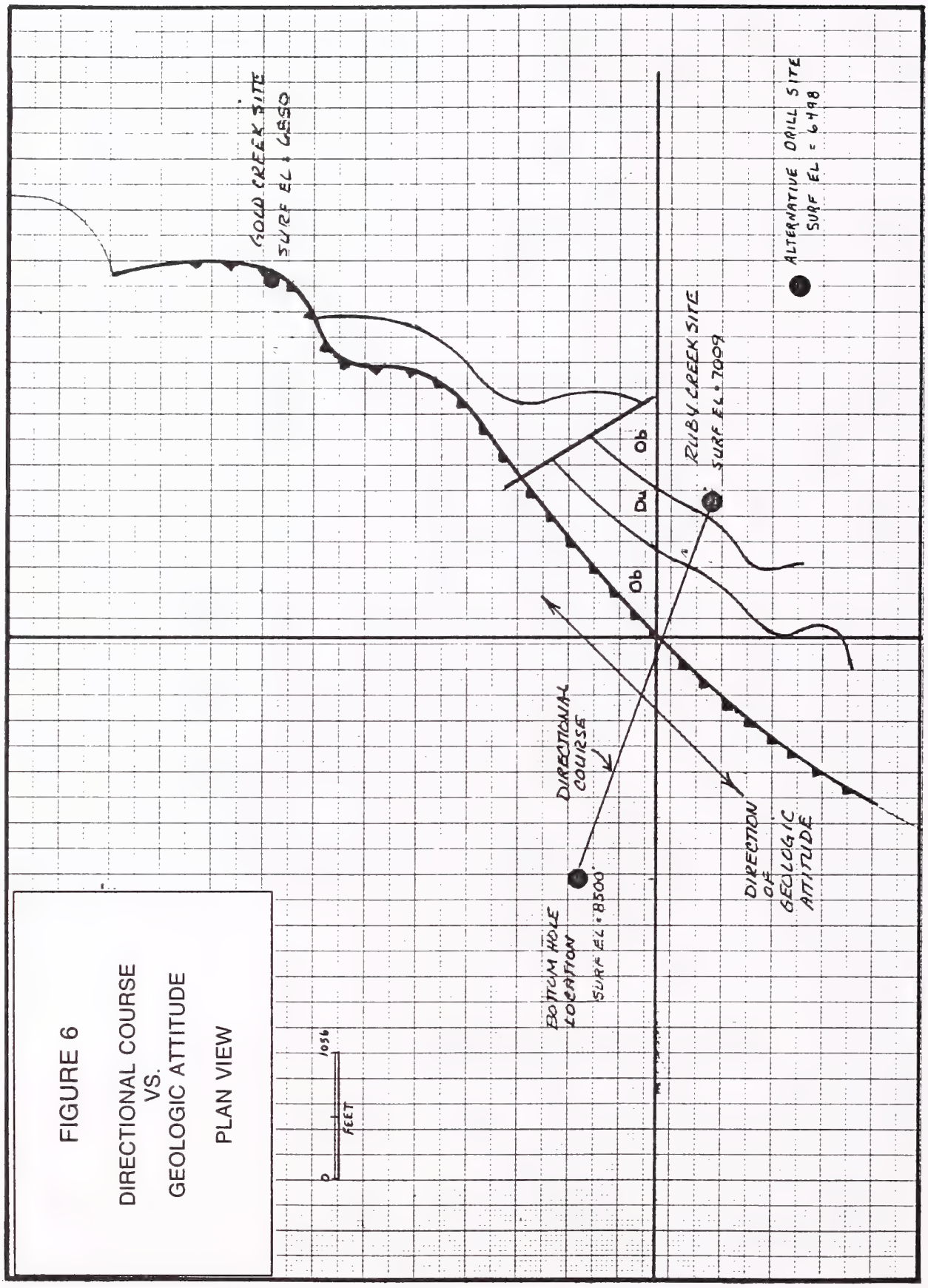


FIGURE 6

DIRECTIONAL COURSE
VS.
GEOLOGIC ATTITUDE

PLAN VIEW

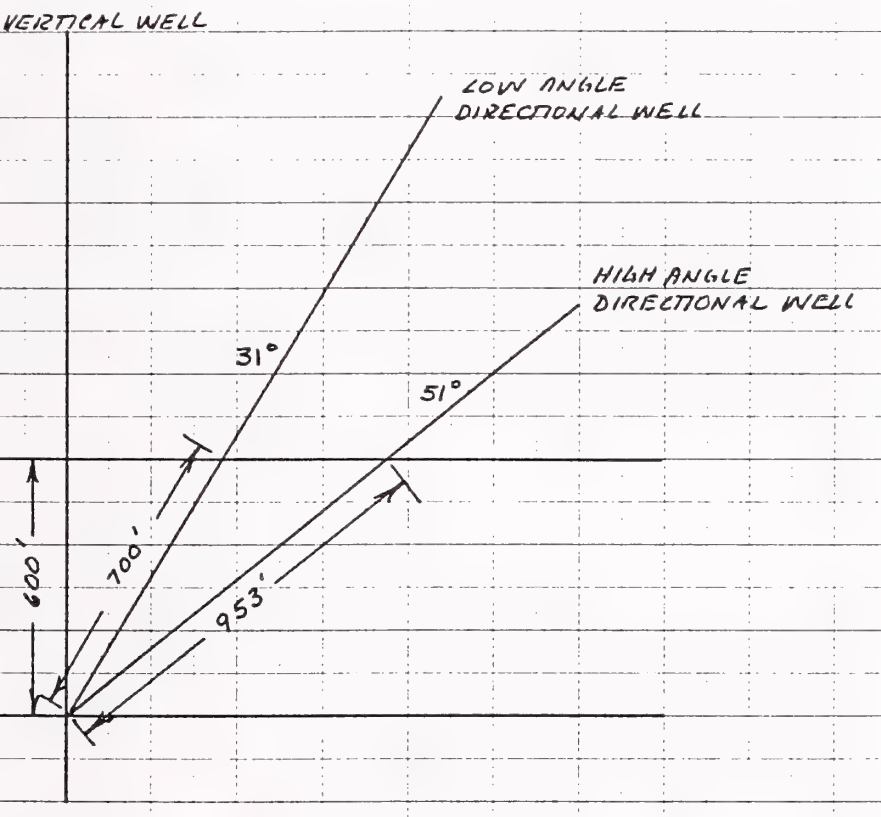
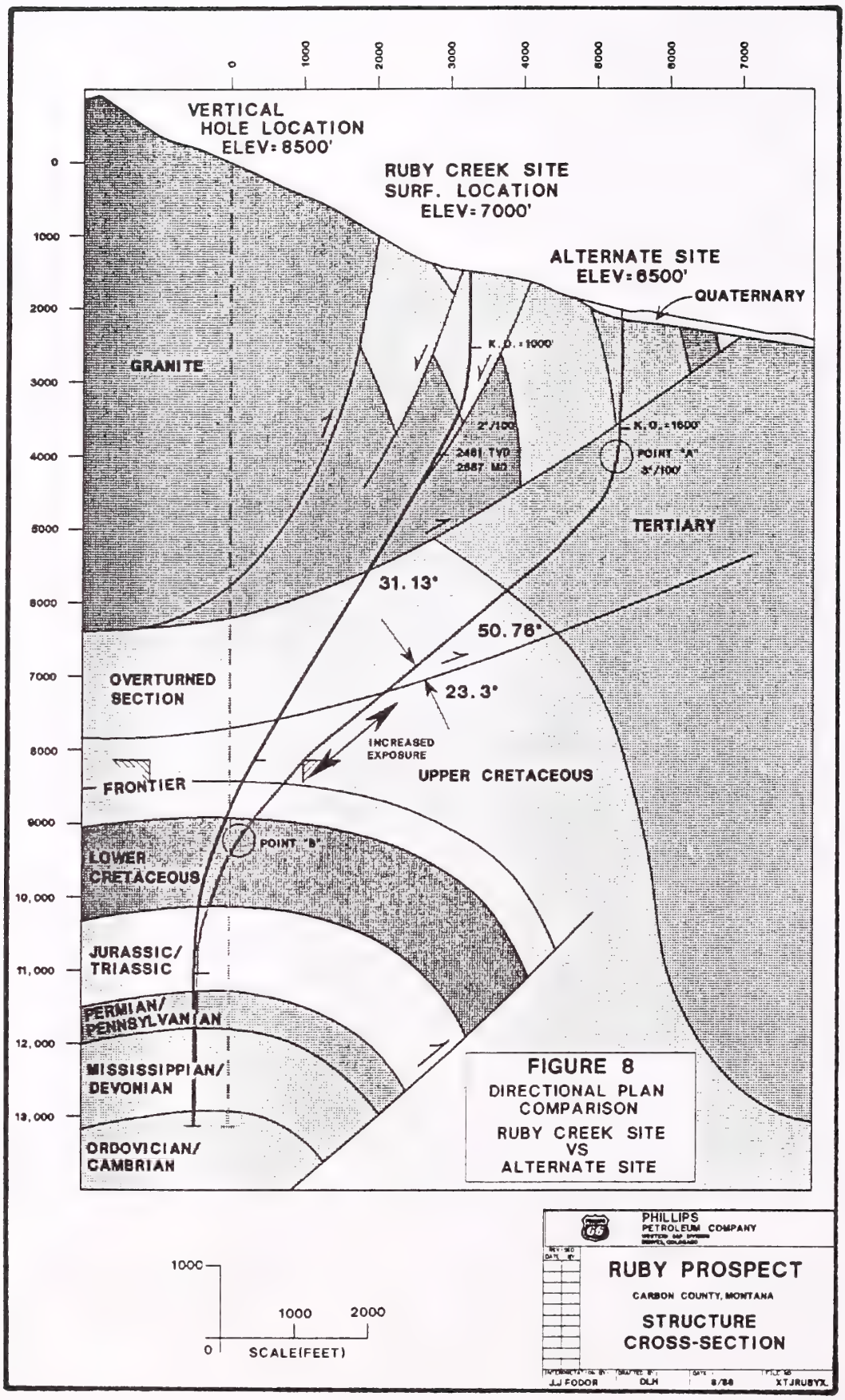


FIGURE 7

INCREASE IN EXPOSURE TO FORMATION DUE TO HIGHER ANGLE

APPENDIX G


VERTICAL
HOLE LOCATION
ELEV=8500'
RUBY CREEK SITE
SURF. LOCATION
ELEV=7000'
ALTERNATE SITE
ELEV=6500'
QUATERNARY
GRANITE
K.O.=1000'
2°/100'
2481 TVD
2587 MD
K.O.=1600'
POINT "A"
3°/100'
TERTIARY
31.13°
50.76°
23.3°
OVERTURNED
SECTION
INCREASED
EXPOSURE
UPPER CRETACEOUS
FRONTIER
POINT "B"
LOWER
CRETACEOUS
JURASSIC/
TRIASSIC
PERMIAN/
PENNSYLVANIAN
MISSISSIPPIAN/
DEVONIAN
ORDOVICIAN/
CAMBRIAN
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10,000
11,000
12,000
13,000
SCALE(FEET)
FIGURE 8
DIRECTIONAL PLAN
COMPARISON
RUBY CREEK SITE
VS
ALTERNATE SITE
PHILLIPS
PETROLEUM COMPANY
RUBY PROSPECT
CARBON COUNTY, MONTANA
STRUCTURE
CROSS-SECTION
J.J FODOR
DLH
8/88
XTJRUBYX

DIRECTIONAL DRILLING ANALYSIS

1. The minimum required angle for the alternate is 50.76 degrees or approximately 20 degrees higher. This will substantially increase the difficulty of drilling. Higher torque and drag will be expected.

2. The bends required to build the angle from vertical to 50.76 degrees (Point A) and to drop the angle back to vertical (Point B) are more abrupt. Increased torque and drag will be expected.

3. The wellbore will intersect the lower fault at 23 degrees, significantly less than the 45 degrees that is ultimately desired. The low angle will increase the tendencies for the wellbore to track along the fault, reducing the chance of drilling through the fault to the desired objectives.

4. Exposure time in the Cody Shale (Upper Cretaceous) will be increased as the amount of drilling footage through this section is doubled. Doubling the length to be drilled through the Cody Shale will more than double the exposure time when combined with the increased difficulty to drill the higher angle.

5. The overturned section is considered to be highly faulted throughout this interval (Point A). The alternate plan would require building an angle within this section. The natural tendencies of this section would try to turn the wellbore in an opposite direction, away from the geologic objectives.

SUMMARY

Analysis of the alternatives has indicated a significant number of disadvantages to drilling the well from another site other than the proposed Ruby A Federal No. 1-9 drill site. Because of the high complexity of the subsurface geology, the historical problems associated with the Cody Shale, and the topographical relief of the area, the proposed site remains the most favorable surface location available to drill the well except for the straight hole location on top of Line Creek Plateau. Too many disadvantages exist, each increasing the difficulty and potential drilling problems, from alternate sites to warrant their consideration at this time.

The major factors that make the easterly, more easily accessible locations unfeasible, is the loss of vertical relief and the increased distance away from the objective. *This is further demonstrated by comparing the probable results of drilling each drill site alternative using a 31 degree angle; the maximum directional angle necssary to drill the Ruby Creek site.*

Ruby Creek Site (Alternative A): *The 31 degree angle well from this site allows for all seven primary and secondary objective formations to be intersected within 500 feet or less of the required target location. In this case, each formation of interest can be penetrated at or very close to the crest of the structure where the greatest potential for hydrocarbons exists.*

Gold Creek Site (Alternative B): *In the event a 31 degree angle well were to be drilled from this site, only the two deepest secondary objective formations could be*

penetrated within 800 feet of the target location. The primary objective formations would be intersected on the steep, down dipping, eastern flank of the structure, as much as 2800 feet away from and 350 feet deeper than the required target. In this case, five of the seven potential objective formations cannot be reached at a reasonable location.

Alternative A Drill Site Variation: *Similar results to the Gold Creek site would be obtained if a 31 degree angle well was drilled from this site. In this case, only the two deepest secondary objective formations could be intersected within 800 feet of the target location. The primary objective formations could, again, only be intersected on the eastern flank of the structure as much as 2,600 feet away from and 400 feet deeper than the required target.*

It must be noted that the present geological presentation is based on seismic interpretations, surface geology, and other available well data. Exact depths of formations and other detailed information cannot be determined until the well is drilled. Because of this, the well plan must remain within the technological limits available today. The current proposal, although difficult, provides the best opportunity in reaching the objectives.

Estimates of time required, risk, and additional expense have been projected below, comparing the proposed Ruby Creek site to the alternate site located east of the Ruby Creek site. Alternative B, Gold Creek is also included here for purposes of comparison. This comparison is based on geologic characteristics and the directional angle required to reach the seven primary and secondary objective formations from each of the three drill site locations being considered.

Ruby Creek Site (Alternative A): *Drilling time is estimated at 150 days as previously stated in the EIS. Although this is the most technically feasible site to drill from, a 15 to 20 percent chance of failure to reach the objective formation exists. This is a result of the directional drilling requirements and geologic characteristics.*

Gold Creek Site (Alternative B): *Drilling time from this site is estimated at 195 days with an increased cost of $850,000 above those projected for the Ruby Creek site. The additional costs result from the increased rig and support costs combined with increased costs of directional services and anticipated corrections to the directional path. The chance of failure to reach the geologic objective is estimated at 60 to 70 percent. This increased risk is associated with the higher angle requirements of 47 degrees, increased exposure to problem shales, and sharper turns required to build and drop the angle.*

Alternative A Drill Site Variation: *Drilling time is estimated at 230 days with an estimated cost increase of $2,000,000. These costs again, are due to the additional rig and support costs and increased directional costs. The chance of failure to reach the objectives in this case is estimated at 80 to 90 percent, as the angle requirements of 51 degrees is considered to be at or near the technical drilling limits considering the geologic characteristics.*

The above time and cost estimates take into consideration slower drilling rates associated with the increased angle and minor drilling problems. Minor corrections to the angle and direction during the course of drilling were also considered and would, no

doubt, be required. Additional factors such as sidetracks and major fishing operations were not considered in the increased cost and time. Should these factors be encountered, the increased time and costs would be higher than estimated above.

In order to minimize the risk, costs, and duration of the well, drilling operations could best be accomplished in the two-year split drilling season that exists because of wildlife and other resource considerations associated with the drilling proposal. Any unforeseen problems that may arise during drilling, which has a higher expectancy as the angle increases could cause the drilling time to extend into additional seasons.

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APPENDIX H

Review Comments and Responses

APPENDIX H

Review Comments and Responses

BOARD OF COMMISSIONERS

Re: Comments DEIS Phillips

County of Carbon

D-1

Red Lodge, Montana
59068

March 13, 1989

U. S. Forest Service
Red Lodge
Montana 59068

Attn: Phil Jacquith and Ollie Jones

The Carbon County Commissioners are responding to your presentation, dated March 9, 1989 and pertains to the access to the proposed Ruby Creek Drill site.

1-1 Ken Ventura, of the Montana Highway Department, was contacted by the Commissioner Taylor and it was reported to him that there are no highway funds available for the necessary construction work needed on the Allen bridge.

1-2 Our #1 Choice for access to the Ruby Creek Drill site would be over the Allen Bridge, then on to the existing Meeteetsee Trail road and the Roberson Draw road. The #2 choice would be to use the Grove Creek road access and connecting with Meeteetsee Trail and Roberson Draw roads.

1-3 Carbon County would be willing to enter in a agreement with Phillips Petroleum to the extent that Carbon County would be responsible for the blading and maintenance of the access road to the Ruby Creek Drill site after the before mentioned road was established. In the future, should there be more extensive drillings Carbon County would be willing to enter into negotiations to construct an even better road.

Commission Chairperson

1-1 Comment noted. Thank you for your comment.

1-2 Given the exploratory nature of the project and the overall uncertainty as to the exploratory well being a producer, we believe that requiring access across the Allen bridge, which would necessitate either reconstruction of the existing bridge or a new bridge would not be economically justifiable. The Forest Service and Bureau of Land Management have recommended Access Variation A-2 because this access route will meet future transportation management goals for the area, and would result in the least amount of major reconstruction of roads, except in Access Variation A-3, which would require the bridge construction/reconstruction. Refer to FEIS, Chapter 3, Exhibit 3-2, Chapter 4, Table 4-1, and Chapter 4, Section 4.2 Transportation, and Appendix B, Exhibit B-3.

1-3 Comment noted. Thank you for your comment.

LETTER 2

Jeff Troxel
1153 29th st.
Cody, WY 82414
307-527-6596

D-2

Dear Mr. Jaquith,

The following is a letter containing my statements opposing the proposed drilling in the Beartooths. I would like to have it read at any meetings that would be appropriate and to have it serve as my vote against the drilling. Thank you.

To Whom it May Concern,

2-1 I am adamantly opposed to any kind of drilling, exploratory or otherwise, on or around the Beartooth Range. That area is a sensitive and uniquely beautiful environment that should be protected at all cost. I can think of no place more deserving of a Wilderness designation.

Phillips Petroleum and all other oil companies must be stopped from going into areas such as this. Whenever there is drilling, no matter how carefull a company may be, there are bound to be accidents. In our lifetime Prince William Sound will never be the same. An area like the Beartooths cannot afford even one mistake.

Let's not be fooled by the term "exploratory drilling". That is the door opener for full scale production, and once the door is open it would be easier to hold back the tide with a broom than to stop an oil company from developing a field. If there is oil up there I don't want to know. It's not worth the aesthetic sacrifice and the environmental risk necessary to get it out. Phillips go home and leave the Beartooths alone!

Sincerely,

Jeff Troxel

CUSTER NATIONAL FOREST
BEARTOOTH D...

JUN -6 1989

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File Phillips DEIS Comments

Jeff Troxel, Cody, Wyoming

2-1 The proposed project location is on the extreme northeastern edge of the Greater Yellowstone Area. The project area is not within an area presently classified as wilderness, proposed for classification as wilderness, nor is it within the Line Creek RARE II area. The proposed project site is not within any area proposed for Wilderness classification in any of the recent Montana Wilderness bills (HR #2090 and SB #2790). The proposed project site is approximately 200 feet from the Line Creek Proposed Wilderness Area as outlined in Alternative W, submitted by the Montana Wilderness Society. The closest wilderness area is the Absaroka-Beartooth Wilderness which is approximately 10-12 air miles to the west.

U.S. Department of Housing and Urban Development
Denver Regional Office, Region VIII
Executive Tower
1405 Curtis Street
Denver, Colorado 80202-2349

D-3

June 7, 1989

Mr. Phillip H. Jaquith
District Ranger
Custer National Forest
P.O. Box 3420
Red Lodge, Montana 59068

Dear Mr. Jaquith:

This is in response to your letter of May 26, 1989, requesting comments on the Draft Environmental Impact Statement (DEIS) for Ruby A. Federal No 1-9 Exploratory Oil/Gas Well, Proposed Oil and Gas Drilling Near Red Lodge, Carbon County, Montana.

Your DEIS has been reviewed with consideration for the areas of responsibility assigned to the Department of Housing and Urban Development. This review considered the project's impact on housing and community development and since there was no anticipated impact we find this DEIS adequate for our purposes.

If we may be of further assistance, please contact Mr. Howard S. Kutzer, Regional Environmental Officer, at FTS 564-3102.

Very sincerely yours,

Barbara H. Richards

Barbara H. Richards
Director
Office of Community
Planning and Development

CUSTER NATIONAL FOREST
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Inform Action

Barbara H. Richards
U.S. Department of Housing and Urban Development
Denver, Colorado

Thank you for your comments.

George S Harger D-4
Box 1226
Red Lodge, Mt. 59068
4 June 8[illegible]

Phil Jaquith
District Ranger
Custer National Forest
Red Lodge, Mt. 59068

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Phil:

I have just finish reading Phillips Petro. Co. D.E.I.S. and I find two areas that should be addressed before a Permit to drill is issued.

4-1 1. Although I do not wish it to be known Mountain Goats inhabit the area just above the drill sites proposed. These are very shy retiring creatures. What impact will these drill sites actively have on them. Will it drive them out to other areas.

4-2 2. What impact will this drill site or proposed field have on the aquifers that
4-3 supply the Clarks, Wyoming Fish Hatchery. The Chemicals, pollutants, and acid rain fall out from

George S. Harger, Red Lodge Montana

4-1 Potential impacts to mountain goats were not included in the DEIS because they were not identified as an issue by the Forest Service and Montana Game, Fish and Parks Department once Phillips had moved their drill site location off the Line Creek Plateau to its present location in Ruby Creek. Conducting drilling operations from the proposed drill site in Ruby Creek or the alternate site in Gold Creek would not impact mountain goat populations on the Line Creek Plateau.

4-2 Section 4.4 of the DEIS and Appendix B discuss potential impacts to water resources including aquifers and groundwater. The DEIS determined that it is unlikely that a significant impact to groundwater would occur due to project implementation.

4-3 Please review Sections 3.1 and 4.1 of the DEIS, and Appendix B which discusses field development. Both the DEIS and Appendix B address air quality and determine that no significant impact to air quality including acid rain would occur.

this proposed well and oil field.

George L Harger

D-5

Mr Phil Jaquish
District Ranger
Red Lodge MT. 59068

6/6/89

Dear Sir:

I understand that "Phillips Petroleum" is interested in drilling in your area.

I would like a copy of the E.A. or the name and address of the Phillips representative in charge of this petition.

Thanks.

Yours.

Claude L. Richardson
726 Poinsettia Ave
Inverness Fla, 32652

CUSTER NATIONAL FOREST
BEARTOOTH DISTRICT

JUN 12 1989

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Claude L. Richardson, Inverness, Florida

Thank you for your comments.

LETTER 6

June 18, 1989 D-6

Scott E. Mann
Box 1107
Red Lodge, MT 59068

Mr. Phil Jaquith
District Ranger
Beartooth Ranger District
Custer National Forest
P.O. Box3420
Red Lodge, MT 59068

Dear District Ranger,

6-1 The balance of life on Earth is reaching the danger zone. Acid rain, the greenhouse effect, water and air contamination and ozone depletion are slowly undermining the integrity of our planet.

President Bush recently chose the Greater Yellowstone Eco-System because of our clean air, to launch his new campaign against needless polution. Two issues echoed loudly; (1) Every American has the right to clean air, (2) Nature needs man's help to restore what we have taken away from our Mother Earth.

6-2 Now is the time for Phillips and other energy corporations to take the cutting edge in new forms of alternate fuels. It is time for these groups, who have been a detriment to our environment, to contribute their vast resources to find the solutions to our fuel problem. They have the ability to make a difference.

I challenge Phillips to become a good neighbor, to pioneer research of new fuels for the future of America. Invest your drilling exploration dollars in a research and developement facility for ethanol. Grains are an abundant renewable resource in Montana. An extensive grain alcohol program in the American fuel supply would allow the American farmer to again operate in the black, improve our acid rain and hydro-carbon emissions, and decrease our dependancy on foreign oil.

6-3 The point of no return is at hand, it is time to start helping nature retain it's course. For these reasons I oppose any and all oil and gas exploration or permits adjacent to the Greater Yellowstone Eco-System and wilderness areas. Wilderness must be preserved at all costs for future generations.

Sincerely,

Scott E. Mann

Scott E. Mann, Red Lodge, Montana

6-1 Comment noted. Thank you for your comment.

6-2 Comment noted. Thank you for your comment; however, the comment is beyond the scope of the EIS for the proposed project.

6-3 See Comment Response #2-1.

E.L. Phillips Comments DEIS

June 19, 1989

D-7

Mr. Phillip Jaquith
District Ranger
Beartooth District
Route 2, Box 3420
Red Lodge, MT 59068

The following is in reply to the Draft Environmental Impact Statement concerning Phillips Petroleum's Ruby A Federal No. 1-9 Exploratory Oil / Gas Well.

I am a wellsite Geologist. I have lived and worked on several dozen drilling locations throughout the Rocky Mountains. These locations ranged from mountain top thru prairie in topography. All were quite different in nature.

Firstly, I am opposed to the drilling of the well in question. My position is not based on hypothesis or probability. It is based on fact and eye witness accounts by myself and others. I have been there. I know how drilling operations procede first hand. This knowledge makes me concerned with this proposal.

The EIS procedure is part of the planning procedure for this well. This is good. But, if I may borrow from Steinbeck, I have seen the best layed operational plans go astray. What could cause an operators drilling plans (planning) to be altered? Many things could contribute: (A) Poor or incomplete planning in the first place. (B) Unforseen natural conditions downhole. (C) Simple, or gross, human error. Etc.

I personally have seen each of the above cause a change in actual planning. Problems encountered have ranged from simply technical drilling ones all the way to serious environmentally related mishaps. Again I say, I have seen this. No plan made by man is perfect and comprehensive in scope. It is my desire that all present here today know this as I so well do. They should not misunderstand otherwise.

My main geologic concern is with the admitted unknown in this proposal. Please refer to Chapter 3, Sections 3.4.1.1 thru 3.4.2.1 of the Draft EIS. These sections concern water resources, both surface and groundwater.

7-1

There in it is stated that; for the uphole faulted / fractured section to be drilled; the location, content or actual existence of freshwater aquifer systems is unknown. I agree. But, surely some must exist since there are active springs in the area. Unknowns? Unknowns? I feel that drilling with such unknowns and the try it and see attitude is a form of poor planning. Surely some groundwater bearing zones will be penetrated by the proposed wellbore.

John Yashinski, Red Lodge, Montana

7-1 Investigations into a natural resource such as water is generally only warranted if there is a potential for an important or significant impact involving changes in quantity or quality. If such a potential is established then it may be necessary to implement more detailed studies to determine how the water resource would be impacted and how to manage a project to minimize impact to the resource. If there is a need for development of water resources for culinary, agricultural, and/or industrial use, then investigative studies may be warranted to determine if adequate quantities of high enough quality water are available. It was established in the DEIS that the potential for significantly impacting water resources is very small. This conclusion was based on knowledge of the proposed drilling activities, methods to minimize impacts, and extrapolation from other completed or on-going projects by analogy. There are no precedences for conducting studies to investigate non-significant potential impacts.

I feel Phillips is aware of this. In fact I was told by one of their public representatives that "the only way to find out that information may be to drill the well." I was astounded by that reply. I am not that interested. I told them so. That is a typical oil industry attitude. It transgresses all behavior. I know this.

7-2 Another point I know is this: When a zone containing any type of fluid is penetrated by a drill bit (wellbore) there is an interaction. The zone and or the wellbore are altered. Reactions may or may not have technical or environmental effects. Technical drilling problems are not my concern in this writing.

Interactions depend, simply put, on the composition of any formation fluids and the differential pressures between the formation (zone) and wellbore. Again simply put, any of three basic things can happen. (A) No noticeable reaction. Pressures are fairly well balanced. Drilling continues as usual. (B) Fluid from the zone enters the wellbore. This is called a fluid gain or flow. (C) Fluid from the wellbore enters the zone. A fluid loss condition commonly called Lost Circulation. Conditions B and C are common and likely in any well drilling faulted / fractured formations at any depth. When, where or even if B or C occur is often, again, an unknown. These unknowns have always concerned me on wellsite. They still do, for far different reasons now. Given this information; consider:

Case (A) above creates no problems. It is uncommon in faulted terrain. In case (B) problems could be purely technical. Drilling may be delayed or slowed. It is possible to procede if not severe. Assuming a freshwater system, the flow may even achieve surface expression. A new water well so to speak. This is a least damage situation. But, consider if the zone flowing is also the source of some nearby surface or subsurface spring. Flow to that spring could be reduced or cut off entirely. We are now in the realm of water rights and lawsuits. Unknowns. Unknowns?

7-3 Now consider case (C). I give a worse case example here. Fluids leaving the wellbore and entering the zone are chemical based. Actual drilling "mud". This is not mud as most of us think of it. It is a pollutant. Various chemicals, many toxic, do not belong in a freshwater aquifer. Again on unknowns: Where does this "mud" go after leaving the wellbore? Is the fractured water zone the source of a spring in the area? How about elsewhere? Is it the source of a well? Does it feed an existing freestone stream in any manner? Unknowns! Unknowns!

7-2 Exchange and mixing of groundwater could occur during drilling. However, the duration of mixing would be relatively short-duration (i.e., the drilling period) and would involve relatively small quantities of groundwater. As soon as the well is drilled it would be cased to preclude mixing in the long-term. The well would be fully cased regardless of whether or not it is used for production or abandoned. Therefore, if mixing did occur, it would be of short duration involving small quantities of groundwater. Drilling muds and chemicals used during drilling would be environmentally safe, approved by the BLM, and registered with the EPA. Consequently, the potential for significant impact to groundwater would be low.

Thirteen and 3/8 inch surface casing will be set from 0 to 3000 feet. Time to drill, set casing and cement for this portion of the well will most likely be accomplished in less than two weeks assuming normal operations. This initial 3000 feet of casing will consist of approximately 1/2 inch of steel with 2 inches of cement protecting freshwater aquifers from well bore operations. Further mitigating measures taken during drilling operations to protect freshwater aquifers are the use of a freshwater drilling system to 4100 feet with bentonite muds and non-toxic polymer additives. Balanced mud weights and build-up of filter cake in the borehole further protect freshwater aquifers during drilling operations.

7-3 Springs that occur along Ruby Creek arise from the alluvial aquifer in the bottom of the valley. Drilling would occur on the topographic saddle above the valley bottom area. The drill bit and stem would not pierce and traverse this shallow aquifer of limited extent. This, combined with the low potential of significantly degrading water quality, would minimize the potential of impacting springs.

Will lost circulation into this zone be so severe that drilling chemicals are even eventually detected in drinking water, springs, wells or streams? I feel it is a possibility. That would be a serious problem to say the least. Who will be monitoring (regularly and often) the water quality of nearby known surface waters? Phillips surely wont go telling all the world about lost wellbore fluids if they do not really have to. Ah, unknowns again.

7-4

I admitt, I too am speaking in unknowns. But my unknowns are as good as anyones. They are simply unknown, but with a factual basis.

Yes, we are all told that any fluid bearing zone will be cased or cemented over to prevent cross contamination. Yes, I agree, they will be eventually. Yes indeed eventually. Not Instantly! Not so at all. It is not technically possible to run caseing or cement with a drill bit in the well. These are very different operations. I know. Phillips does also. Our average citizen, ignorant of oil industry jargon, does not know this. I do not want the uninformed to believe all they are told. Ah, blissfull ignorance. This is a drilling operators greatest friend in dealings with the local public.

7-5

The barn door will be closed. After the horse has already run away! The damage will have already been done. The environment is not part of a game of chance. I have seen it lose before. I must stress this fact.

Finally, I was opposed to Phillips Petroleum's proposal to drill on Line Creek Plateau. I am, again, opposed to the Ruby A Federal No. 1-9 prospect and all of it's alternatives. None of them mitigate any of my concerns.

I am in full support of the "no action" alternative to this proposal.

Thank you for your time.

Sincerely;

John Yashinski (Geologist)
Box 1284, 207 N. Platt
Red Lodge, MT 59068

7-4 Water resource monitoring would be implemented with the construction, operation, and reclamation of the project. This would entail visually observing water courses for sedimentation and other water degradation and specifying immediate remedial action if problems are identified. No formal water monitoring involving analyzing water samples for chemical constituents is planned as it is unlikely that serious impact to water quality, ground or surface, would occur as assessed in the DEIS.

7-5 See Comment Response #7-2.

LETTER 8

CUSTER [illegible]
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L.L. D-8

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W. M. & T. File Phillips Comments D-8-5
For Tech
Env Tech
Eco Con

June 20, 1989

TO: USFS

I am a resident of Carbon County and have been for 33 years. I was born in Red Lodge and have pretty much lived here all of my life, except for a short time when I served in the military of which I am very proud to have done. I have been in the ranching business for most of my working years, however now the economy has made me seek out other employment in town. I now presently work for the State of Montana as an Real Estate Appraiser for the Dept. of Revenue.

All statements I am about to make reflect my own personal opinion and do not represent any organization or group.

I am in total favor of the Phillips Oil exploration on the east slope of the Line Creek Plateau. It will bring in money to our community and badly needed jobs into Montana. I deal with hard working taxpayers everyday in my job and can tell you this, that they need help with the burden of paying for the cost of their schools, roads and general county services. These people do not have cushy retirements checks coming in from former jobs nor are they on welfare or get a disability check. These people live here and have always lived here and they hammer out a living in this community everyday,they do not come and go with the seasons.

There seems to be a concern over the elk population in the Line Creek area and how they will be affected by this operation. I have hunted all of my life since I have been old enough to carry a rifle, I have been a professional hunting guide for nearly four years. I have hunted in areas where oil exploration has been introduced, these locations I am speaking of is the Luther and Roscoe areas. The Roscoe area I am speaking of is the Mackay Ranch, this ranch has probably around six pumping sites. Any native of this area will tell you that the elk herd on the Mackay Ranch is probably some of the best elk hunting around. The ranch leases the hunting rights to two outfitters so this could be considered a high management elk herd as there is no public access to this herd except for late season cow permits. The point I am trying to make is that oil exploration has not disturbed this herd one bit in fact it is one of the fastest growing herds around and at the same time hunters have probably the highest kill ratio of all the elk hunting in Carbon and Stillwater Counties. The Montana Fish and Game seem to be worried about the how the oil rig will disturb the elk from Oct. through Nov. has anyone stop to think that hunting season is open then. If I was an elk I think I would be less concerned about an oil rig than an army dressed in orange chasing me with high powered riles.(Remember I am a hunter)

Gary L. Lay, Roberts, Montana

Thank you for your comments.

I do not believe that we should just turn the oil companies loose to do what they want with our public lands either. With the restrictions that the E.P.A. and other environmental oganizations have in place I believe that Phillips can be held accountable.

In conclusion Carbon County needs this oil exploration and I believe that Phillips and the United States Forest Service will act in a responsible manner as they did at the Ammoco drilling site on the main fork of Rock Creek.

Sincerely

GARY L. LAY
Rt. 48, Box 1094
Roberts, MT 59070

Bruce W. Brannick, Red Lodge, Montana

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Box 1233
Red Lodge, MT 59068
20 June 1989

Mr. Phillip Jaquith,
Supervisor
U.S. Forest Service
Red Lodge, MT 59068

Dear Phil:

I have just returned from several weeks out-of-state, and completed a cursory reading of the Forest Service, Dept of Agriculture and Dept. of Interior (BLM), DRAFT ENVIRONMENTAL IMPACT STATEMENT for Phillips Petroleum's proposed drilling on the roof of the world, above Red Lodge, Line Creek Plateau, an environmentally sensitive area.

9-1

I've also spoken to some highly knowledgable people much concerned with the ecology of Carbon County and Montana, people interested in maintaining the pristine beauty of the Beartooth Pass, and all the forested lands which make this region of Montana unique and irreplacable in our future and that of our children.

Since the Forest Service's own management of the area has:

1. Prescribed burns for enhancement of elk habitat.

2. Cancelled grazing leases to better feed and otherwise manage the area elk habitat.

9-2

3. Closed many roads to vehicle travel in order to quell disturbances to those Elk, and

4. Spent Federal monies on a fifteen year study of game (elk) management in your straightforward brochure entitled COORDINATING ELK AND TIMBER MANAGEMENT, it would appear illogical and contra-indicated, to turn about, one-hundred and eighty degrees, and approve destructive oil drilling that will cancel the good sense of previous and expensive counter studies.

9-1 The location for the proposed Phillips exploratory well has been changed and is no longer proposed atop the area commonly know as Line Creek Plateau. The proposed project site location for the Proposed Action Alternative is in the Ruby Creek drainage. Refer to Chapter 1, page 1-1 - 1-2 and Exhibit 1-2, page 1-4.

9-2 The project site for the Proposed Action Alternative is within Management Area C as prescribed by the Custer Forest Plan. The goal of this management area is to manage key wildlife habitat areas for the optimum quality and diversity that the land can offer (Refer to Custer Forest Plan, page 49, and Ruby A Federal No. 1-9 Oil/Gas Well EIS, page 1-6). Although the goal of this management area is to feature management of key wildlife habitat, this goal is not to the exclusion of other resource uses and considerations. See Custer Forest Plan, page 49-52. The Custer Forest Plan specifically recognizes prior existing mineral lease rights for all management areas. The Custer Forest Plan directs the preparation of an environmental analysis in order to identify the necessary mitigation measures to minimize any effects to wildlife habitat. The decision to allow Phillips to complete the proposed exploratory well is based on the finding of no significant impacts to wildlife given the mitigation measures identified in the FEIS.

The Custer National Forest is committed to emphasizing wildlife habitat management goals in the area. As you point out, closing some old roads and not re-issuing livestock grazing permits are some of the actions the Forest Service has taken. We do not believe that permitting the drilling of the proposed exploratory well flies counter to the management direction the Forest Service continues to pursue in the area. As explained in the FEIS, all project related activities will take place during the non-critical period of use for the featured species, elk (June 15-October 15). In addition, all roads will be closed and rehabilitated if the well is non-productive. The EIS recognized that significant impacts to elk could occur but are avoidable and unlikely to happen with implementation of mitigation measures prescribed in Chapter 5 (FEIS, Chapter 4, page 4-48).

LETTER 9

9-2 The research in Coordinating Elk and Timber Management shows that road building and "jeep noises," are anathema to Elk. Imagine, then, the curse to these animals of giant oil trucks carrying multi-tons of steel pipe, and other drilling equipment, tanks, separators, and the like. Moreover, the well-being of many other animals besides Elk are involved, among them the Mountain Lion and the Black Bear. We are not talking here about minnows on the Tom Bigbee.

9-3 Your tenure as an involved official of the Forest Service, your decisions NOW, will be held against you, historically, good, bad, or indifferent.

9-4 I realize politics are always involved in these decisions, but in my book, the Forest Service is and always should be basically concerned not only with conservation, their raison de etre, but morally occupied with the national future. And I further believe that Service has to take a vigorous and unyielding position of responsibility for wildlife resources. To me, FS is all about PROTECTION OF THE PUBLIC INTEREST.

9-5 You already have Dr. Fred Van Dyke making a biological investigation of impact on this country, and I understand this investigation has another three years to fruition. Before any harm is done, tearing up tundra on Line Creek Plateau, or damage to animals and habitat by mammoth trucks grinding up a nature lovers paradise, the Forest Service ought, at least, to allow Dr. Van Dyke to complete his vital research, to fully document Elk movement.

9-6 As you yourself realize, some areas of public lands are just not suited for multi-use, and there is no place East of Rock Creek for elk to winter. Notwithstanding, there is no energy shortage; we ought now to be using grain-based ethanol to begin to break our terrible dependence upon oil and its attendant pollution.

9-7 I am sure you've heard the Arab story about letting the camel put his nose into the tent on a cold winter's night. Soon, the entire camel is inside the tent. Weakening now to Phillips demands, their greed, will mean other industries in mining and related pursuits will demand their right to tear up the scenery, and future citizens of this country, including your own grandchildren, will be the tragic losers.

Respectfully,

D. W. Bennett

9-3 Comment noted. Thank you for your comment.

9-4 See Comment Response #9-2.

9-5 The location of the proposal of Phillips Petroleum Company was changed due to environmental considerations of the fragile ecosystems associated on top of the Line Creek Plateau, and Phillips' reevaluation of seismic data caused a shift in the perceived location of the target geologic structure, thereby making a directional drilling attempt physically possible. The current location is below the rim of the Plateau and no tundra ecosystem is involved. The FEIS does incorporate the latest findings of Dr. Van Dyke and according to data presented by the wildlife biologists no significant impacts should result to elk given the mitigation measures required in the FEIS. These mitigation measures developed in coordination with the Montana Department of Fish, Wildlife, and Parks were designed to protect elk movement corridors during the seasons which they are in use (fall, winter, and spring). The provisions of limiting drilling operations described in Section 5.3.6 will minimize the probability of displacing elk from the Ruby A site. See Section 5.3.6, FEIS.

9-6 The FEIS recognizes the importance of the area as elk winter and fall/rutting range, spring/calving habitat, and as migration corridors. See FEIS, Chapter 3, Section 3.6

9-7 Approval of the exploratory well will not grant Phillips Petroleum or any other company carte blanche right to any future developments within the area without the necessary and complete compliance with the NEPA process.

LETTER 10

Thompson D-10
6/20/89

Dear Mrs. Jagnow,

We read with interest the article in the 6/15 Billings Gazette concerning the drilling of an exploratory well.

We think it would be a shame not to explore for oil. But we hope it is done in a responsible manner with great care being given to protect the land and animals, especially if further wells are developed.

Thanks

Wilburn and Carlene Thompson
Greybull, Wyo.

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Wilburn and Carlene Thompson, Greybull, Wyoming

Thank you for your comments.

D-11

United States Department of Agriculture | Soil Conservation Service | Federal Building, Room 443, 10 East Babcock Street, Bozeman, MT 59715

June 22, 1989

Mr. Phillip H. Jaquith
District Ranger
Beartooth Ranger District
Custer National Forest
P.O. Box 3420
Red Lodge, MT 59068

RE: Ruby A Federal No. 1-9 DEIS

Dear Mr. Jaquith:

We have reviewed the above draft impact statement and have no comments to offer.

Sincerely,

Robert J. Sackett ACTING

RICHARD J. GOOBY
State Conservationist

cc:
James B. Newman, Director, Ecological Sciences Division, SCS, Washington, DC
Ron Batchelor, Biologist, SCS, Bozeman, MT

CUSTER NATIONAL FOREST.
BEARTOOTH DISTRICT

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Richard J. Gooby, State Conservationist
U.S.D.A. Soil Conservation Service
Bozeman, Montana

Thank you for your comments.

LETTER 12A

D-17

STATE OF WYOMING
OFFICE OF THE GOVERNOR
CHEYENNE 82002

MIKE SULLIVAN
GOVERNOR

June 20, 1989

Mr. Phillip H. Jaquith
District Ranger
Beartooth Ranger District
P.O. Box 3420
Red Lodge, MT 59068

Dear Mr. Jaquith:

The Wyoming State Planning Coordinator's Office has circulated the Draft EIS, Ruby A Federal No. 1-9 Exploratory Oil/Gas Well to State agencies for review and comment. I am forwarding those comments generated to you for consideration.

Thank you for allowing us the opportunity to review this Draft EIS.

Sincerely,

Sheryl Jeffries

Sheryl Jeffries
Executive Secretary

/sj

Attachments

CUSTER NATIONAL FOREST
BEARTOOTH District

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Sheryl Jeffries, Executive Secretary
Office of the Governor, State of Wyoming
Cheyenne, Wyoming

Thank you for your comments.

LETTER 12B

State of Wyoming
Oil and Gas Conservation Commission

GOVERNOR MIKE SULLIVAN CHAIRMAN
COMMISSIONERS
HOWARD M. SCHRINAR GARY B. GLASS GENE GEORGE EDDIE MOORE
STATE OIL AND GAS SUPERVISOR
DONALD B. BASKO

June 6, 1989

Mr. Rick Engelmann
State Planning Coordinator's Office
Herschler Building
Cheyenne, WY 82002

RE: Draft Environmental Impact Statement, Rudy A federal No. 109 Exploratory Oil/Gas Well, proposed oil and gas drilling near Red Lodge, Carbon County, Montana

Dear Mr. Engelmann:

In reply to your memo we received June 6, 1989, asking for comments on the above noted Environmental Impact Statement, I wish to point out that the drill site is in Montana. However, I certainly recommend that Phillips Petroleum Company be allowed to proceed. The reason is simply that I believe that this prospect has a high degree of being productive. Right across the state line to the South in Township 58 North, Range 103 West, Park County, Wyoming, we have had three small discoveries over the years in fields we identify as "Terry", "North Line," and "Line Creek."

The geology of the area is extremely complex, but in my view holds great promise and perhaps find significant reserves. Phillips should be allowed to test this structure.

Very truly yours,

Donald B. Basko,
State Oil and Gas Supervisor

DBB/dl

777 WEST FIRST STREET, P.O. BOX 2640, CASPER, WYOMING 82602 (307) 234-7147 FAX (307) 234-5306

Donald B. Basko, State Oil and Gas Supervisor
Oil and Gas Conservation Commission
State of Wyoming
Cheyenne, Wyoming

Thank you for your comments.

LETTER 12C

DIRECTOR AND
STATE GEOLOGIST
GARY B. GLASS

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—STRATIGRAPHY

LABORATORY TECHNICIAN
JAY T. ROBERTS

June 12, 1989

MEMORANDUM

TO: Rick Engelmann, Wyoming State Clearing House

FROM: Gary B. Glass, State Geologist

SUBJECT: Draft EIS, Ruby A Federal No. 1-9 exploratory oil/gas well, near Red Lodge, Carbon County, Montana

I have reviewed the above titled DEIS and support the drilling of this exploratory well. This well will provide valuable information for future drilling in Wyoming as well as in Montana. The temporary disruptions to other activities in the National Forest will be more than offset by the information gained from this well, even if the well is dry. If the well provides a discovery, the development can be managed in an acceptable manner consistent with multiple use concepts.

GBG:rh

Gary B. Glass, State Geologist
The Geological Survey of Wyoming
Laramie, Wyoming

Thank you for your comments.

Bratsky D-13

Bridger Mt.
June 24-37

Custer Forest Ranger=
Ten Joaquith=

I am a long time hunter in the Pine Creek area, I just can't see the Fears objection to the cut said to be Cutler on Ruby Creek. If there were 69 elk killed in 36- I only about 8-10 elk were killed near Ruby Creek and they were there only traveling through the area. Most elk are killed above Pine Creek above John McCallers cabin 90% of all elk killed are south of Roberson draw and west of Roberson draw top and some at the Ranger station area. Calfing is not done in the rocks around Ruby, most calves are born near the Ranger station and near Pine lake area and the timbered area north of Pine Creek. I just can't believe that the oil rig would stop breeding. I've seen elk breeding before and they really don't care where they are at. I did see elk killed at the 32 ranch where timber was being cut and hauled right from the camp. At Sardines I've seen elk killed right by the cars and camps. I've killed 3 bul at Roberson draw south & west, 90% of the Bigs hunters hunt close to Roberson draw North in Mill Creek, Ruby & Gold Bluff they want to get the easy ones Any body that takes horses and gets back about Ranger trail usually get their elk.

We need oil exploration in our

Leo C. Bratsky, Bridger, Montana

Thank you for your comments.

area and most environmentalist drive cars and they should all be already paved and oil and gas off, the 3 refineries all close by, and all road the paper shows in our county. Oil for the 3000 of road it's in solid rock and won't hurt anything. 5 years ago I was contacted by the state of Montana inspector to try and show him where an oil well was drilled in the middle of a irrigated field and I had a hard time showing him where the actual rig was, it was so cleaned up. A town of another well south of Bridger after they hauled thousands of tons of gravel right in the middle of a beet field and could never see where they went, they cleaned it up so well.

I'm 100% in favor of drilling in Rocky and surely disagree with what the opposition is saying, so a real jobs types, the oil

I herd of elk killed near Roby ~~at~~ in 1988 could be brought at the Game auctions at Bigs for $2000 ea. If the rig was there I'll really believe that 12 elk would have been killed in 87 oil well or not.

Thank you.

Leola Bratsky -

190 elk were drawn
69 killed. Vehicle accidents and hunting.

LETTER 14

D-14

Dear Sir

This is my comment on the proposal,

14-1 I think that the drilling should not be done in the Area used by the Elk or Deer.
There has been to much of the land distroied by man,
As it is now we have oil wells all over that has been Capped and not doing any thing but sitting there so why distroy our Elk rangs & winter feed and Calving grounds for man to make more money and the Animals to loose there home if some one doesn't do something there will be no land left.
Can you see this land that they wont with roads and land tore up I can't see that.
there isn't meny places left like Red Lodge and Cook City Were you can get away from the rest of the world and be in the beautiful land that God created.
I say no to the drilling in this Area
My vote is no.

NO

Wanda Zeimer
Po BOX 892
Crane, Mont 59217

406-482-1084

CUSTER NATIONAL FOREST
BEARTOOTH DISTRICT
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Wanda Zeimer, Crane, Montana

14-1 The Forest Service and Bureau of Land Management are also concerned about the potential impacts to wildlife, and elk in particular. Based on the biology of elk, the probability of significant impacts on elk seasonal range transition, fall/rutting, winter, and calving habitats could be minimized by restricting operational activities to the period June 15 to November 15 for no more than 2 consecutive years. However, drilling activities that extend beyond approximately October 15 could have some effects on recreationists (fall hunting). Additionally, in years of abnormal climatological events, drilling operations may need to be terminated prior to October 15 in order to reduce impacts to elk. The Forest Service believes the mitigation measure outlined in Section 5.3.6, Chapter 5 in the FEIS allows for the flexibility needed in the determination of when drilling activities should cease and that this determination is based on minimizing impacts to elk as the main objective. The strict use of a period of operation from June 15 to September 15 could jeopardize the completion of the drilling operation within a 2 year period. The professional opinion of the wildlife biologists is that drilling operations at the site for more than 2 years would have a greater impact on the elk than would extending operations into a single fall/rutting season.

Thank you for your comments.

LETTER 15

Lois Nichol, Billings, Montana

1035 O'Malley Drive
Billings, Montana 59102
June 24, 1989

D-15

Phil Jaquith
District Ranger
Beartooth Ranger District
Custer National Forest
P. O. Box 3420
Red Lodge, Mt. 59068

Dear Sir:

Re: Ruby Exploration Gas/Oil Well

15-1 Having been a land owner of two properties in the Red Lodge area for many years....one of which was within 1/2 mile of the well drilled last year, I am totally against allowing another well to be drilled in this area.

Our elk herd has not reappeared since the last well was drilled. The land is not reclaimed as yet. I am not worried about the tourism. I am worried about

15-2 destroying fragile terrain and loss of animals. It seems ludicrous that no roads are now allowed in the area and that cattle are not allowed to graze there..yet you consider allowing huge machines and trucks in over a new 12 foot wide road cut into a hillside.

15-3 When is the Forest Service going to recognize that esthetic and environmental value of our wilderness forest lands far outweigh the economic?

Sincerely,

Lois Nichol

Lois Nichol

CUSTER NATIONAL FOREST
BEART[illegible] DISTRICT

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15-1 Respondent's comment concerns the Amoco Well drilled in the Red Lodge area in 1987-1988. This well accessed federal minerals but was drilled on private surface, which was reclaimed to the surface's owner specification. Although not germane to the Phillips proposal, the Forest Service and BLM will respond to the comment giving more specific details concerning the Amoco well.

15-2 The location for the proposed project has been moved to the Ruby Creek drainage and off the Line Creek Plateau, the original project site. There are no fragile ecosystems or terrain involved with any of the proposed alternative site locations. Some construction will be necessary to provide access and to construct the proposed well pad. The rehabilitation plan (Appendix D, FEIS) outlines the specific measures and performance standards which will be required of the company for the current proposed location.

See Comment Response #9-2.

15-3 See Comment Response #2-1.

LETTER 16

D-16

Box 7
Froid, Mt. 59226

June 29, 1989

Phil Jaquith, District Ranger
Beartooth Ranger District
Custer National Forest
P. O. Box 3420
Red Lodge, MT 59068

Dear Ranger:

16-1 I oppose the giving of permission to the Phillips Petroleum Co. to drill near the Absaroka-Beartooth Wilderness.

16-2 The cumulative effects of destruction and degradation of the wildlife, water, air quality, vegetation, and future well-being of the area is not worth the small benefit to a few jobs, nor the big profit to Phillips.

Please reject this plan.

P. Bradley
Patricia Bradley

CUSTER NATIONAL FOREST
BEARTOOTH DISTRICT

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Patricia Bradley, Froid, Montana

16-1 Comment noted. Thank you for your comment.

16-2 The cumulative effects to wildlife habitat, air and water quality, and vegetation are discussed in Chapter 4 and Appendix B of the FEIS. The FEIS and Appendix B, which address the cumulative effects of possible future development, have determined that significant impacts to these resources can be minimized if the mitigation measures outlined in Chapter 5 are implemented and the drilling activities are confined to the period of June 15-November 15 for no more than two consecutive years. (See DEIS, Chapter 5, Section 5.3.6, page 5-6).

LETTER 17

Peg Smith, Joliet, Montana

D-17
6/30/89

To whom it may concern,

I am writing to oppose oil drilling on Dix Creek. This is a very fragile area and should be considered for wilderness rather than development. Drilling and road construction would severely effect the elk. 17-1

I believe the permit should not be approved. This development should not be allowed in that area.

Sincerely,
Peg Smith
RR1 Box 72
Joliet, Mt. 59041

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BEARTOOTH DISTRICT
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17-1 Potential impacts to elk have been analyzed in detail, and mitigation measures described in Section 5.3.6 were developed, in consultation with the U.S. Forest Service and the Montana Department of Game, Fish and Parks, so as to prevent significant impacts to elk.

See Comment Response #9-5.

LETTER 18

Nancy and Jim Coates, Red Lodge, Montana

Nancy and Jim Coates
P.O. Box 377
Red Lodge, Montana 59068

July 6, 1989

George Weldon
Acting District Ranger
Beartooth Ranger District
Custer National Forest
P.O. Box 3420
Red Lodge, Montana 59068

Dear George:

We are against Phillips Petroleum Company exploring for oil along the Beartooth face for the following reasons:

18-1 | 1) We are concerned about the impact to the wildlife, particularly the elk in that area;

18-2 | 2) We do not think that the impacts of full-field development have been adequately addressed or studied (both environmentally and socioeconomically);

18-3 | 3) More and more and more we are seeing that accidents CAN and DO happen. We do not want to put our immediate environment in jeopardy.

We vote for the NO ACTION alternative in this matter.

Sincerely,

Nancy and Jim Coates

CUSTER NATIONAL FOREST
BEARTOOTH RANGER DISTRICT

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18-1 See Comment Response #14-1.

18-2 Appendix B discusses the impacts associated with a reasonably foreseeable field development scenario. Due to the lack of "hard data" and the wildcat nature of the proposal, some assumptions have been made which may or may not prove to be correct in the future (See Appendix B, page B-33). For example, the socio-economic impacts will be largely dependent upon potential reserves, if any, and the production life of any reserves. The Forest Service believes that Chapter 4 of the FEIS, and Appendix B discloses the cumulative impacts of the proposal and the reasonably foreseeable level of development that could occur. This disclosure is based on existing seismic data, the current understanding of the geology of the area, and established well control data from fields to the northeast and southeast of the prospect area.

18-3 The Forest Service agrees. Phillips Petroleum Company will be required to comply with all BLM and Federal Standards of fluid and gaseous blowout prevention.

LETTER 19

U.S. Department of the Interior
Fish and Wildlife Service
Helena, Montana

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Fish and Wildlife Enhancement
Federal Bldg., U.S. Courthouse
301 South Park
P.O. Box 10023
Helena, Montana 59626

D-19

IN REPLY REFER TO:
FWE-61130-BILLINGS
M.19 Custer NF/Ruby A Federal
Exploratory O/G Well (ER# 89/495)

July 6, 1989

Mr. Phillip H. Jaquith
District Ranger
Custer National Forest
Beartooth Ranger District
Route 2, Box 3420
Red Lodge, Montana 59068

Dear Mr. Jaquith:

The Fish and Wildlife Service has reviewed the draft Threatened and Endangered Species Biological Evaluation (February, 1989) and the draft Field Development Addendum to the Threatened and Endangered Species Biological Evaluation (April 6, 1989) which are included as Appendix F of the DEIS, Ruby A Federal No. 1-9 Exploratory Oil/Gas Well, Carbon County, Montana. Based on the information provided in the evaluations, the Service concurs in your determination that the proposed project will not affect the endangered bald eagle (Haliaeetus leucocephalus), peregrine falcon (Falco peregrinus), black-footed ferret (Mustela nigripes) or the threatened grizzly bear (Ursus arctos horribilis).

Your efforts to meet our joint responsibilities under the Endangered Species Act of 1973 as amended, are appreciated.

Sincerely,

for Kemper McMaster
Acting State Supervisor
Montana State Office

cc: Suboffice Coordinator, USFWS, FWE-61130 (Billings, MT)
BFA (ERT) (Washington, DC)

DCHRISTOPHERSON/dc/clh

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"Take Pride in America"

Thank you for your comments.

D-20

LETTER 20

Ron and Carolyn Gerondale, Billings, Montana

7-8-87

My wife and I would like to go on record as being against any development in the Ruby Creek drainage or Pine Creek Plateau. This is a beautiful area and prime elk habitat. It really makes us sad to think it could be ruined with new roads and oil field development.

20-1

Ron and Carolyn Gerondale
3507 Miles
Blgs, Mt 59102

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BEARTOOTH DISTRICT

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20-1 See Comment Response #14-1.

The rehabilitation plan (Appendix D, FEIS) outlines the specific measures and performance standards which will be required of Phillips for the current proposed location. This would ensure revegetation of disturbed areas would occur.

D-21 **LETTER 21** *Daniel M. Frank, Billings, Montana*

Phil Jaquith
District Ranger
Beartooth Ranger District
Custer National Forest
P.O. Box 3420
Red Lodge, Montana 59068

July 7, 1989

Dear Phil,

I-1 I am writing in regards to the Phillips Petroleum Company's proposal to drill an exploratory oil/gas well on the east face of the Line Creek Plateau in Ruby Creek Draw.

As a Montana native, sportsman, and concerned citizen, I beg you not to allow this proposed operation.

I-2 To allow such a proposal will be in contrast with all the studies done to improve wildlife habitat, espically the elk habitat in the area. A travel plan was developed a couple years back that disallowed vehicle travel to improve elk habitat. Controlled burns in the area took place to improve the forage. Livestock grazing is not allowed so that all the vegetation is available to wildlife. If the Forest Service and BLM allows Phillips to proceed with their proposed operation, it will be in total disregard of public trust. Those government agencies will have lied to the people of this state if this area is developed.

I-3 Many people choose to live in this state because of the wildlife, the pristine environment, and the recreational opportunities that Montana has to offer. Many of us sacrifice financial opportunities to live in this state. We choose to live here because of the way of life Montana has to offer. Part of that way of life includes hunting, fishing, hiking, camping, and other activities which take place on public lands. To interfere with this way of life hinders the very foundation of existence for many Montanans.

CUSTER NATIONAL FOREST
BEARTOOTH DISTRICT
JUL 10 1989

I-4 In closing, I would like to ask again that you not allow Phillip's proposed exploratory well. Thank you for your time and consideration.

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Rec Con

Sincerely,

Daniel M Frank

Daniel M. Frank

Daniel M. Frank
34 Campbell Dr.
Billings, MT 59102

21-1 Comment noted. Thank you for your comment.

21-2 See Comment Response #9-2.

21-3 The criteria for establishing the significance of the impacts to recreation opportunities within the area is displayed in Chapter 4, Section 4.8.2. Overall, the analysis in the FEIS indicated that recreation impacts associated with the proposed project would be relatively minor. Some short-term displacement of a limited number of recreationists would occur. This impact would be minimized through the adoption of the mitigation measures outlined in Chapter 4, Section 4.8.6 and Chapter 5. The Forest Service has decided to restrict drilling operations during the big game rifle season to lessen the impacts to these recreationists, if this does not jeopardize a two year drilling period (See Record of Decision).

21-4 Comment noted. Thank you for your comment.

LETTER 22

D-22

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BEARTOOTH RANGER DISTRICT

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PHILLIPS PETROLEUM COMPANY
CASPER, WYOMING 82601
152 NORTH DURBIN STREET, SECOND FLOOR

July 5, 1989

Beartooth Ranger District
Custer National Forest
Route 2, Box 3420
Red Lodge, Montana 59068

Attn: George Weldon

Re: Ruby A Federal 1-9
Draft Environmental
Impact Statement

Dear Mr. Weldon,

Phillips Petroleum Company has the following comments on the DEIS for the Ruby well proposal. The majority of these comments are reiteration of concerns expressed by Phillips throughout the process of creating the DEIS.

22-1 The mitigation measure requiring the rig be moved from the drilling site over winter should be reworded to allow the rig to remain on-site, tower down, or to remove the rig from the site altogether. The decision should weigh both costs and benefits of removing the rig and should be decided by Phillips and the Forest Service. A rig stacked on site will not cause elk to avoid Ruby Creek over the course of the winter. Moving the rig out in the fall and back in in the spring will take up valuable time and complicate the drilling process. In either situation the well site itself will be fenced to preclude elk activity.

22-2 We object to continually rewriting the DEIS (or FEIS) to include late breaking information. While we appreciate Fred Van Dyke's work on the Line Creek elk herd there is no basis in law requiring the data be added to the document. Larry Hayden-Wing has already discussed in the document Dr. Van Dyke's preliminary findings. As you know the DEIS has already been revised to include other very recent studies by Dr. Van Dyke, including the implications of these studies. The information now contained in the DEIS is complete and provides an adequate basis for making a decision on the Ruby Project.

22-3 Project timing restraints are a continued item of concern. Though Phillips has agreed to operating only from June 15 to October 15 it is necessary to voice our displeasure. The lease provided May 16 to October 15, a five month window of operation, which will minimize impacts to the resident/ migratory elk herds. The biology of the elk situation provided June 15 to November 15, again 5 months of operation without impacting the elk. The "preferred alternative" as being discussed by the Forest Service provides June 15 to October 15, possibly September 15 depending on the fall

S.H. Oden, District Superintendent
Phillips Petroleum Company
Casper, Wyoming

22-1 The impact on elk by leaving the drill rig on-site is discussed on page 4-45 of the DEIS which states that leaving the drill rig on-site will contribute substantially to the avoidance behavior in elk. Since this site is an important part of the fall elk range and a travel corridor used frequently by elk it needs consideration and a decision will be made on this issue in the Record of Decision. Fencing will be done in a manner to minimize impact to elk. The agencies will use the best information possible in the analysis until a decision is made.

22-2 Wildlife, specifically the effect the alternatives will have on elk is a critical issue. The agencies will use the best information available up until a decision is made.

22-3 This EIS is not tied to the lease dates. This analysis is a site specific analysis that determines drilling dates that will minimize impacts to the resource values for the area. The rationale for these dates is to minimize significant impacts to elk; the dates will be from June 15-November 15. To minimize impacts to rifle hunters, a proposed June 15-October 15 date is being considered. Again, the decision on mitigation for drilling dates will be decided in the Record of Decision. The Forest Service has not received (or it is not included in the draft) a revised H_2S contingency plan. We still feel this is necessary even if it is decided to use the cutoff date of October 15 as there are bow hunters that use this area after the first week in September. In addition, no decision has been made on drilling dates.

vegetative conditions. This is a four month window of operation. While we acknowledge that weather will begin to deteriorate after October 15 Phillips should be responsible for the decision to risk weather or leave the site for the winter. This restriction coupled with the moving the rig off-site reduces a five month season to one of only three and one-half months. Additionally, it has been expressed that Phillips will be out by October 15 to protect hunters from H2S during rifle season. The H2S contingency plan has been revised, at the request of the Forest Service, to provide for hunter safety. The Recreation Analysis states that no significant impact will occur to the hunters' recreational experience unless activity continues for more than two years. It appears that in an effort to satisfy the hunting lobby, drilling activity is being shut down prematurely.

22-3

The Appendix B "Field Development" discussion, while provided in large part by Phillips, is still a significant concern. The level of detail requested of Phillips by the Forest Service and reflected in the DEIS may lead the reader to believe that this is how development will be done. It must be reiterated that until the first well is drilled and tested nothing is really known about the oil/gas reservoir or how to develop it. The information provided is a very premature idea of how development might proceed. The Field Development scenerio is not based on fact.

22-4

There has been a request made by the Greater Yellowstone Coalition that another alternative drill site be analyzed. As a result of that it has been suggested that the third party ID team engage a Petroleum Geologist to review Phillips' confidential data and drilling program to verify the determination by Phillips experts that drilling from a distance further to the east is not feasible for the exploratory well. This information was provided in the alternatives discussed but not fully analyzed (Sec 2.2.5) and discussed on pages 2-14 and 2-16 in detail. Additional analysis and discussion is unnecessary.

22-5

It should also be remembered that the GYC, as a member of the EIS task force, was more involved than anyone other than Phillips in directing the DEIS. Most of their concerns, comments, and requests were included in the document. That the GYC advocates yet another alternative at this point in time is irresponsible given their position in the task force.

22-6

In closing, let me repeat that nothing mentioned here is new to your staff. These items have all been discussed in detail before but it is necessary to reiterate issues not satisfactorily resolved.

Yours Very Truly,

PHILLIPS PETROLEUM COMPANY

S. H. Oden

S. H. Oden
District Superintendent

RCT/ERDIST:mw

22-4 The Field Development Scenario is our best determination at this time and it is pointed out as such in the FEIS. The Forest Service and Bureau of Land Management are required under NEPA to look at reasonable foreseeable development using the best information available.

22-5 The Forest Service feels the Greater Yellowstone Coalition did have a good point the variation drill site proposed by them is analyzed in the FEIS. The Greater Yellowstone Coalition's involvement in the task force has nothing to do with a reevaluation of the drilling feasibility from a distance further to the east of the proposed drill site; if a deficiency is recognized at any time in the analysis process, the Forest Service will respond to it.

22-6 The FEIS must disclose to the decision-makers exactly what the trade-offs are in drilling feasibility, as well as information collected at the different drilling sites and compare the effects on the resource values. This additional alternative is necessary.

LETTER 23

Richard A. Strait, Associate Regional Director
National Park Service
Rocky Mountain Regional Office
Denver, Colorado

NATIONAL PARK SERVICE
ROCKY MOUNTAIN REGIONAL OFFICE
12796 W. Alameda Parkway
P.O. Box 25287
Denver, Colorado 80225-0287

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JUL 1 1 1989

Mr. Curtis Bates, Forest Supervisor
Custer National Forest
P.O. Box 2556
Billings, Montana 59103

Dear Mr. Bates:

We reviewed the draft Environmental Impact Statement (DEIS) for the Ruby A Exploratory Oil/Gas Well, Carbon County, Montana (ER 89/495) and offer the following comments.

Under the Clean Air Act, the Federal Land Manager and the park Superintendent or Forest Supervisor of a class I area have a responsibility to protect air quality related values such as visibility and vegetation in the class I area from adverse impacts of air pollution. While the DEIS acknowledges that the nearest National Park Service class I area, Yellowstone National Park, is 33 miles west of the proposed well site, the actual nearest class I area to the site is the North Absaroka wilderness in the Shoshone National Forest, approximately 10 miles closer. Both of these areas may be potentially impacted by the proposed development described in the DEIS.

23-1

Individual oil wells can be major sources (more than 250 tons per year) of gaseous air pollutants such as sulfur dioxide, nitrogen dioxide, and hydrocarbons, as well as particulate matter as described in the DEIS. With full field development, a maximum of 18 wells is projected. Nitrogen dioxide and certain hydrocarbons can form ozone in the presence of sunlight. Both ozone and sulfur dioxide can cause adverse impacts on vegetation such as aspen, certain pines, Douglas fir, and lichens. These vegetative types exist in the proposed well area as well as in the nearby class I areas: Yellowstone National Park and the Absaroka Wilderness Area. Also, sulfur dioxide and nitrogen dioxide in the presence of sunlight can be oxidized to fine particulate-sulfates and nitrates, respectively. These fine particulates reduce visibility by scattering and absorbing light.

23-2

While the DEIS discusses (and indeed requires) various measures such as the use of water or other dust suppressants to reduce or eliminate particulate matter during the various phases of the well development, there is no mention (or requirement) that technology be employed at the well to reduce gaseous pollutant emissions. Under the terms of the lease, the lessee is required to

23-3

23-1 Thank you for correcting the error in the Air Quality Section. There are three wilderness areas in the general vicinity of the project including the North Absaroka, Washakie, and the Absaroka-Beartooth. In addition to Yellowstone National Park, the North Absaroka and the Washakie Wilderness Areas are classified as PSD I areas since they were officially designated wilderness prior to the Federal Air Quality Act of 1977. Nevertheless, these PSD I areas would not likely be impacted for the reasons discussed in Section 4.1 of the DEIS and in Appendix B.

23-2 Airborne emissions from construction and drilling equipment are discussed in Section 4.1 of the DEIS and in Appendix B. No significant impact was assessed for the reasons presented in these sections. Emissions from production are discussed in Appendix B. No significant impacts were assessed; however, monitoring was recommended only for production.

23-3 All oil and gas production companies operate production wells under the same requirements and stipulations. These require that emissions meet the air quality standards for a PSD class. Appendix B assessed the impacts on air quality due to production and concluded that no impairment of PSD I standards would occur.

conduct operations "in a manner that minimizes adverse impacts to the land, air, water, to cultural, biological, visual and other resources..." Gaseous pollutant emission control technology is available for the various sources at an oil well complex, and should be required as a control measure in the Final EIS.

We appreciate the opportunity to comment on the DEIS.

Sincerely,

/sgd/ Richard A. Strait

Richard A. Strait
Associate Regional Director
Planning and Resource Preservation

cc:
Mr. Phillip H. Jaquith, District Ranger, U.S. Forest Service, Beartooth District, Red Lodge, Montana
Mr. Matt Millenbach, District Manager, Bureau of Land Management, Miles City District, Miles City, Montana

Greater Yellowstone Coalition

CUSTER NATIONAL FOREST
BEARTOOTH RANGER DISTRICT
JUL 1 1989
RECEIVED
Inform Action

Phil Jaquith
District Ranger
Beartooth Ranger Distirct
Custer National Forest
P.O. Box 3420
Red Lodge, Montana 59068

Re: 2820

Date: July 7, 1989

Dear Mr. Jaquith:

The following constitute the comments of the Greater Yellowstone Coalition on the Draft Environmental Impact Statement (DEIS) Ruby A Federal No.I-9 Exploratory Oil/Gas Well. This document presents a clear picture of the environmental impacts of the proposed action. The process that has brought the proposal this far appears to be fair and open. The vast majority of the DEIS facts and analysis should stand as a credit to the public reviewers and the lead and cooperating agencies, as well as the proponent.

24-1 There is, however ,a serious deficiency in the display and selection of suitable alternatives. In this respect the document fails to provide the decision-makers with information needed to base a final decision that is fully informed. The proposed alternative also fails to meet the management goals of the Custer National Forest Plan. The goal of this area is to manage elk habitat areas for the optimum quality and diversity that the land can offer. Other resource activities will be modified to maintain or improve existing habitat. (Custer Forest Plan, Management Area C.)

24-2 Two alternatives, Ruby A and Gold Creek were examined in detail. Several alternatives were considered, but not examined in detail.
A no-action alternative was presented. The proponent's preferred alternative is Ruby A. The Gold Creek alternative is unacceptable to the proponent due to technological constraints. The DEIS is deficient because the preferred alternative can not be weighed against a meaningful alternative, since one has not been proposed. We are unaware if the technical constraints that should have eliminated Gold Creek from consideration were discussed during the development of alternative selections. The DEIS appears then to have become an exercise of justification rather than the document of discloser and analysis intended by the National Evnironmental Policy Act.

24-3 A vital source of information from which the decision makers are guided is contained in Exhibit 2-6, Geologic Structure Cross-section of Ruby A Federal...Gold Creek...and Target Location. This cross-section is a distortion of fact in that the depiction is for two sites over a mile apart. This graphic liberty results in target zone entry points that distort the

P.O. Box 1874 • Bozeman, Montana 59771 • (406) 586-1593

LETTER 24

Don Bachman, Program Assistant
Greater Yellowstone Coalition
Bozeman, Montana

24-1 See Comment Response #9-2.

See Comment Response #24-2.

The Custer National Forest is committed to emphasizing wildlife habitat management in the area. The Forest Service does not believe that permitting the drilling of the proposed exploratory well is counter to the management direction of the Forest Plan. As explained in the FEIS, all project related activities will take place during the non-critical periods of use for the featured species, elk (June 15 to October 15). In addition, all roads will be closed and rehabilitated if the well is non-productive. If the well is productive, an additional analysis will be prepared to address the potential effects of production and possible field development.

24-2 The Draft EIS analyzed four viable alternatives, including the No Action Alternative. Based on your comments on the Draft EIS, a fifth alternative was analyzed between the Draft and Final EIS. All of these alternatives were considered viable alternatives although the risk of failure due to technical aspects varied by the alternative sites. Therefore, the Forest Services feels that analysis and documented disclosure contained in the FEIS if fully consistent with the intent of the National Environmental Policy Act.

24-3 Appendix G was developed to further explain and display the trade-offs of directionally drilling from the proposed drill site, variation drill site immediately to the east, and Gold Creek.

drilling patterns and thus the angles that are so crucial in making the alternative site decisions. What is needed are exhibits showing cross-sections for the following:

24-3

1. Vertical hole location
2. Gold Creek Site
3. Ruby A. Site
4. North-South at proposed target entry.

In addition, there must be a planar view of drill site alternatives showing relationships between the surface locations and the target structure.

24-4

Finally the topographic map used for the site determination is inadequate at the scale of 1:24000 and 40 foot contour interval. Decisions relating to road construction, wildlife habitat disturbance, visual impact, angle of entry and distance from the target zones, among others, require the best possible standard of information and analysis. A mapping scale on the order of 1:5000 with 10 foot contour intervals is the standard for other land-use siting decisions, such as ski area design and engineered road construction. The proposed action is of such magnitude and import that the record of decision must be based upon the best possible discloser document. The inclusion of additional cross-sections, planar view and large scale mapping would result in an analysis of a viable alternative we refer to as Ruby B.

24-5

The Ruby B alternative to be examined in the FEIS would be located downslope and east of Ruby A. This alternative site cannot be adequately examined with the current level of information presented, but it appears to lie somewhere between the private land alternative dismissed from analysis and the Ruby A site preferred by the proponent. The shift appears to be on the order of a couple of thousand feet east (on the same approximate north-south line as Gold Creek) and a few hundred feet lower. Since the target zone is considered to be south-west of the Ruby area, this alternative would be viable as opposed to Gold Creek which has been dismissed from consideration.

The location of Ruby B is shown on the photo copies attached (9-15 and 9-30). Photocopies 9-26 and 9-29 illustrate the specific location of Ruby A. It is easily seen from these photographs that the displacement from the preferred site is minor, while the topographic differance is significant and important in allowing the Forest Service to modify activities to conform with the management goals of the area. That Ruby B would contribute to these goals are shown by the following:

1. Removed from wildlife cooridor and gathering areas.
2. Significantly less visual to moving and stationary wildlife.
3. Less visual to humans from all points of view.
4. Probably less intrusive from noise and lights.
5. Removed from the Face of the Mountain Trail use area.
6. Eliminates new road construction over steep ground (c. 1600')
7. Requires less site disruption for drill rig.
8. Site easier to reclaim.
9. Site easier to service with less disturbance during production.

24-4 The analysis of alternatives and associated effects was based upon "on the ground" review of the proposal and alternatives identified. Therefore, the site determinations, road construction, wildlife habitat disturbances, visual impacts, and other effects were not determined or based on a 1:24,000 scale map. The information gathered or verified "on the ground" was displayed on that scale map for disclosure purposes which we believe to be appropriate. Portions of the road access that would require extensive construction were surveyed and an engineering design prepared in accordance with professional engineering standards. These surveys are contained within the file for this proposed project and were used during the analysis process.

24-5 The Forest Service agrees that the Ruby B (Alternative A Drill Site Variation in the FEIS) site would contribute to the goals identified in your comment. As you state, the topographic difference is significant. This significant difference in elevation has a major effect on the technical feasibility, risk of failure of the project, and potential for information loss. All these trade-offs are evaluated in the FEIS.

24-5 Disadvantages of the Ruby B site alternative would center around its proximity to surface water resources, that would appear to be mitigable.

The wildlife resource of this area is the focal point and primary concern of the Greater Yellowstone Coalition. The non-occupancy periods and the proponent's willingness to accept two drilling seasons with rig removal are examples of cooperation in this venture. Geologic information is subjective, and the siting of wells of this nature is based upon best guessing and highest success probabilities. The constant in this project is the presense of elk and other wildlife in the area that will be displaced and impacted. Decisions will still have to be made during the exploratory and development operations. The analysis of the Ruby B alternative and the probablility of selecting this site will make these operational decisions more sound. The environmentally preferred alternative will be Ruby B, and the proponent should be able to adjust to this deviation and still maintain their goal of a decisive exploratory effort.

Respectfully submitted by the Greater Yellowstone Coalition,

Don Bachman
Program Assistant

Encl.

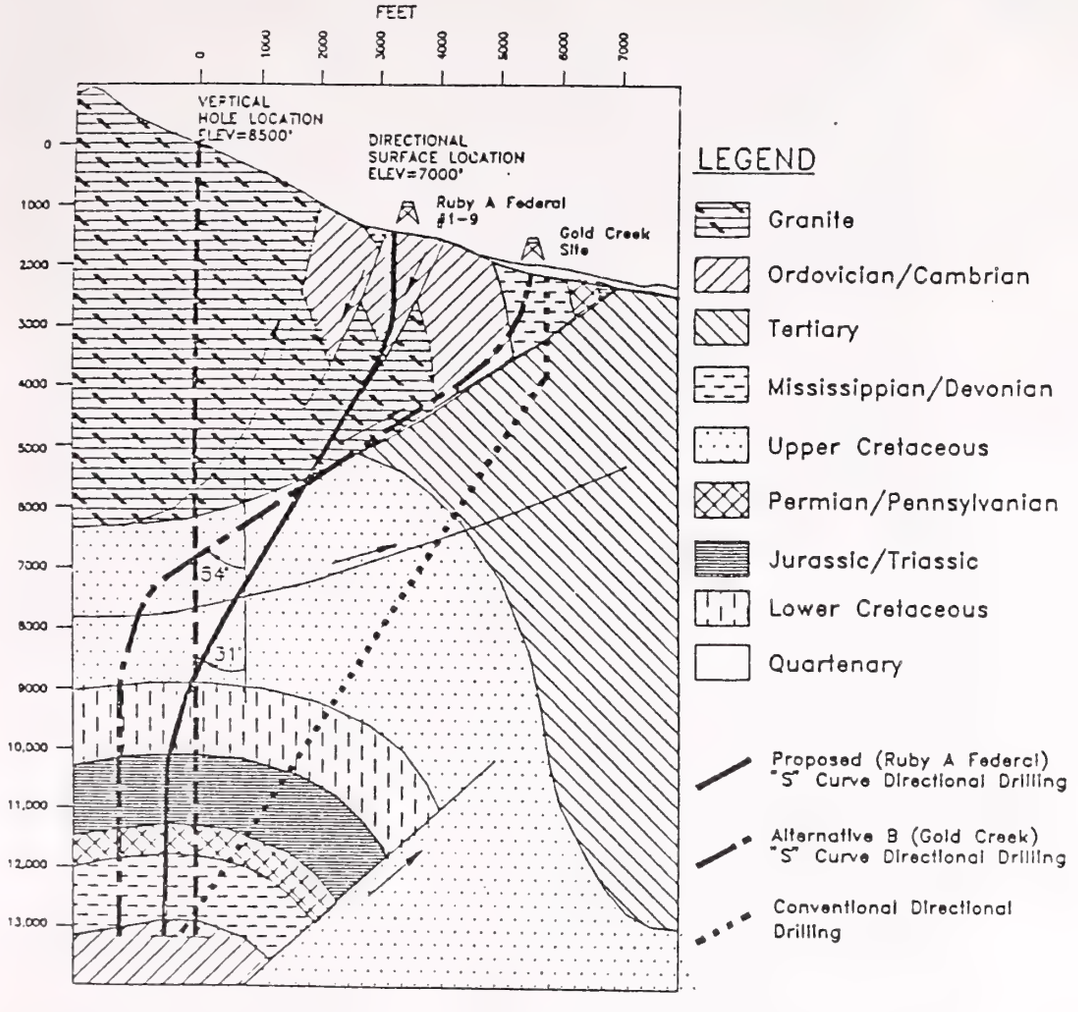
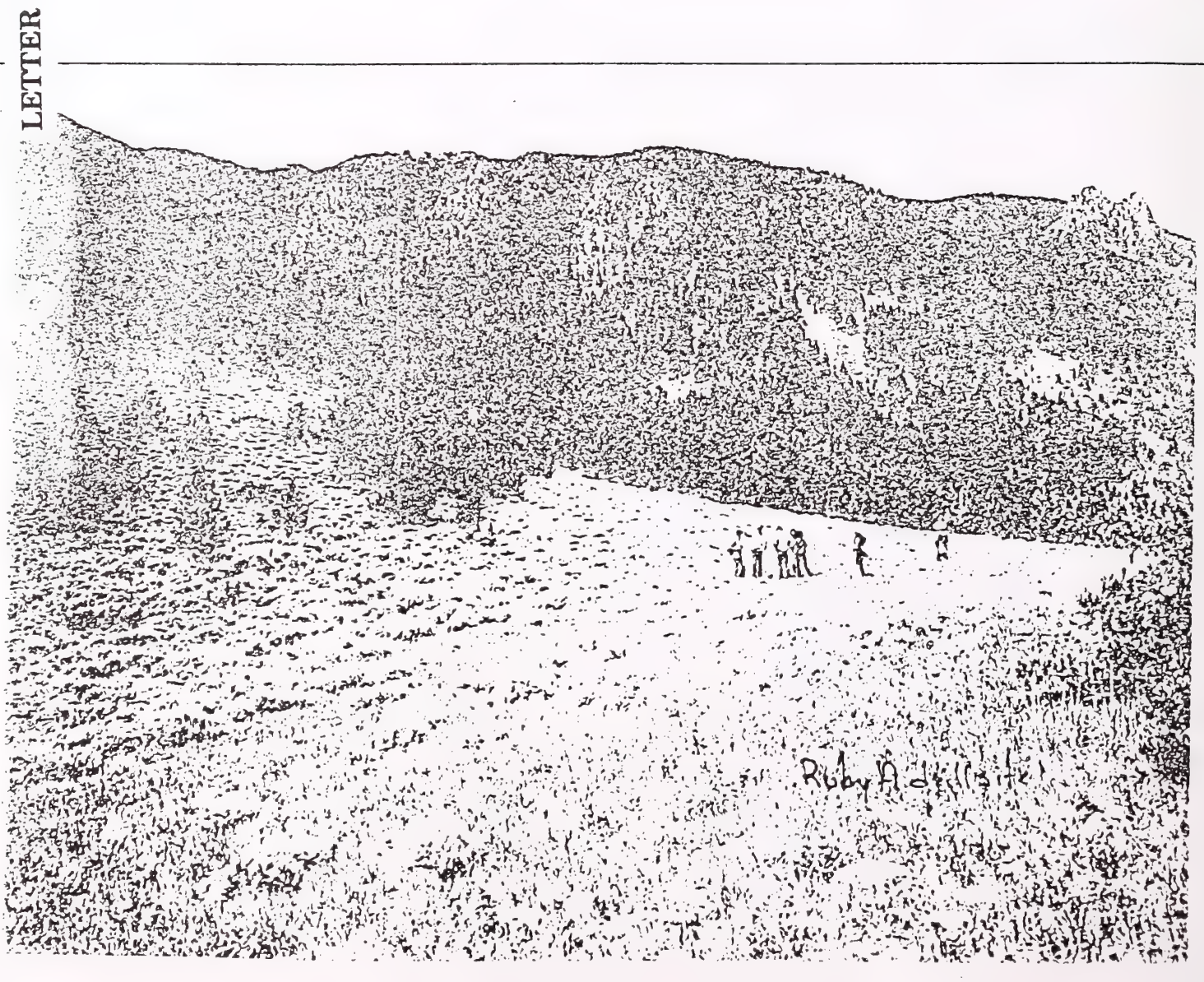


Exhibit 2-6. Geologic Structure Cross-section of the Ruby A Federal No. 1-9 Drill Site, Gold Creek Drill Site, and Target Location.

LETTER 24



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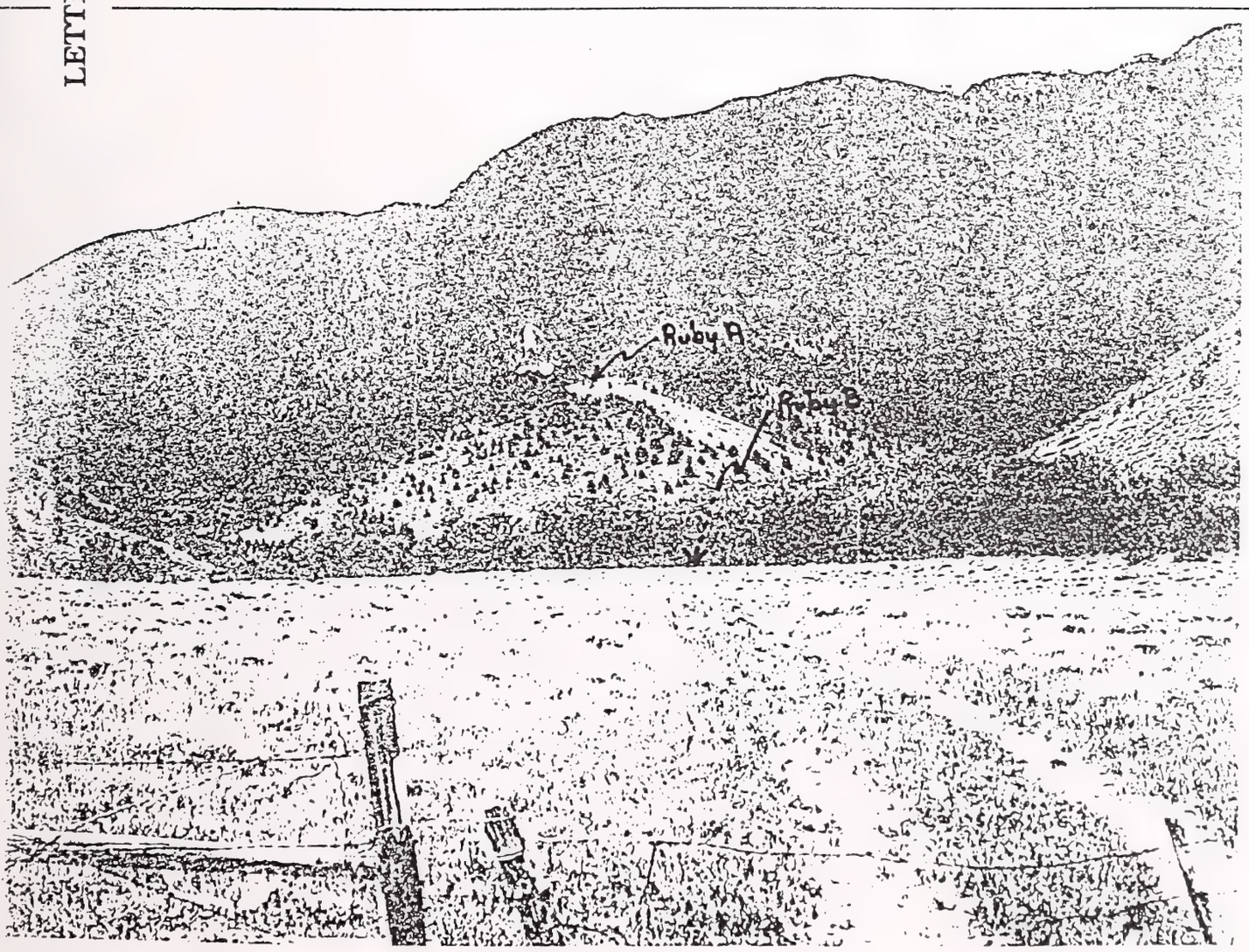

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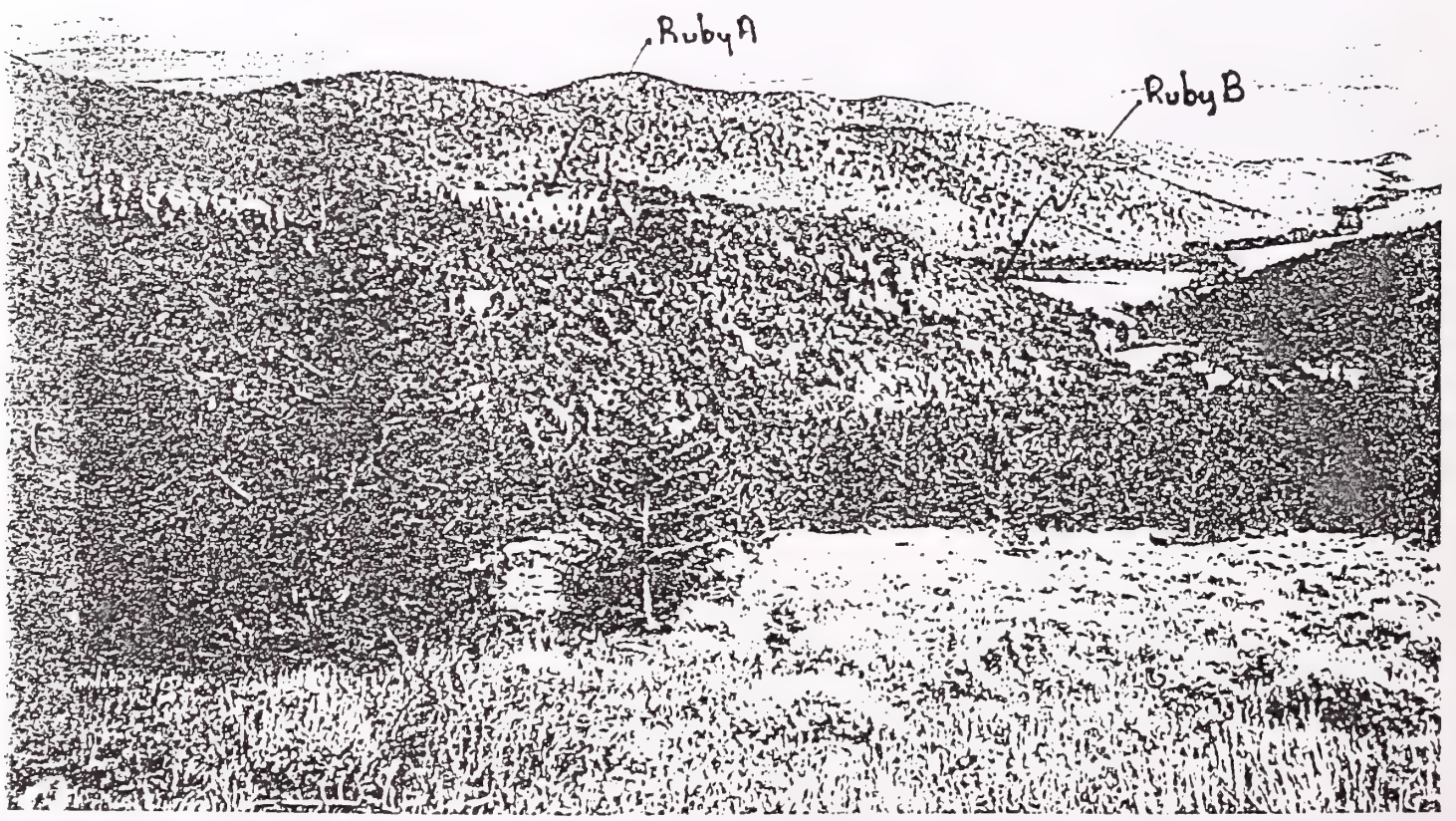

LETTER 24

D-25

July 10, 1989

LETTER 25

Lee Fears, Director Region 5
Montana Wildlife Federation
Red Lodge, Montana

District Ranger
Beartooth District
Custer National Forest
Red Lodge, MT 59068

Dear Sir:

The following are the concerns of the Montana Wildlife Federation concerning the proposed Ruby A Federal No. 1-9 ex;loratory oil/gas well.

After reading the DEIS and the letter to the task force, it becomes quite evident that our previous concerns have been taken lightly.

25-1 Let us again go over management direction. The closing of roads to vehicle travel to avoid disturbance of elk means just that. If four - wheel drive pickups disturb elk, it would be extremely ignorant to believe that heavy equipment and semi truck travel would not. The roads are closed, period.

The cancelling of grazing leases and the program of prescribed burns combined with the road closures are positive examples of a land managing agency with the best interest of the public resource in mind. This is precisely what you are entrusted to do. The Ruby A Federal No. 1-9 project flies counter to this management direction and you very well know it. Approval of this proposal would be a blatent betrayal of the public trust.

25-2 If we are to, indeed, take this DEIS seriously, as the best possible analysis of the situation, then only the best and most complete research should be sought. The first is Dr. Fred Van Dyke. The completion of his research is essential. The failure to gather all of the data possible will result in failure to the public ownership of the resource.

25-3 Secondly, are the results of a 15-year long research on elk and timber management. The parallels between road building and travel to this proposal are one and the same. This project was funded and supported by the public managing agencies including the USFS. The public should be able to trust the Forest Service to follow the recommendations of their own research. Failure to do so is another betrayal of the public trust.

25-4 The proposed well site plus the proposed alternatives are all nonsense. We both know that. The EIS process is designed to try to make the best of a bad situation. There is nothing in the DEIS that would indicate that this proposal is, in any way, necessary nor palatable.

25-5 It is our belief that the wildlife resource is of far greater value than the short sighted greed of this proposal. The Montana Wildlife Federation is not opposed to oil/gas development as long as it does not jeopardize our precious wildlife resource. This particular proposal should never have gotten to this stage, but it is not too late to right the ship that is leaning heavily in the wrong direction.

The future generations need us to work together to protect those resources which we hold so dear.

CUSTER NATIONAL FOREST
BEARTOOTH DISTRICT
JUL 10 1989
RECEIVED

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F, W & T	
For Tech	
Rec Tech	
Rec Con	
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Info Rec	

Sincerely,
Lee Fears

Lee Fears
Director Region 5
MWF
Box 401
Red Lodge, MT 59068

25-1 See Comment Response #9-2.

If the well is produced, the road to the site will be closed except as needed for routine maintenance, and all production facilities will be located off-site. In summary, the Forest Service believes that with the mitigation for elk as outlined in Chapters 4 and 5 of the FEIS, any impacts to elk and elk habitat will be insignificant.

25-2 The Forest Service agrees that the best and most complete data should be gathered and used in the analysis. We believe the FEIS reflects this and forms the basis for the analysis of environmental effects in Chapter 4 and the mitigation measures outlined in Chapter 5. However, we will never have all of the data or all of the answers. The Custer National Forest is committed to support Van Dyke's study for two additional years. During this time we hope, through data gathered from radio-collared elk, to substantiate if changes do result in seasonal distribution and use patterns of elk.

25-3 The Forest Service agrees there is a certain parallel between this project and the recommendations of the Montana Cooperative Elk-Logging Study 1970-1985 in so far as roading is concerned. Certainly many of the recommendations of this study have to do with timber harvest which is not part of this project. However, this project has been designed and does consider many of the recommendations of this study concerning roading such as: timing of actions to avoid both elk and elk hunting activities, maintaining a low level of open road density, exclusion of livestock grazing, and maintaining cover for elk.

The Forest Service realizes the importance from a migration standpoint of the saddle which will be the location of the drill site. Given the mitigation measures to be employed, we do not believe that locating the 2-2.5 acre drill site within the saddle will result in a significant adverse impact either in preventing elk to return to winter range, or in the permanent selection of a less desirable route to winter range.

25-4 The FEIS analyzes a reasonable range of alternatives including a No Action Alternative. The purpose of the FEIS is to disclose the environmental effects of the proposed action and the alternatives to the public and the decision-makers, and it is used as the basis from which a decision is made.

25-5 The Forest Service agrees that the wildlife habitat of the area is important. However, based on the evidence presented in the FEIS, it is indicated that the wildlife resources will not be jeopardized given the mitigation measures outlined in Chapter 4 and 5.

D-26

LETTER 26

Sherry Fears, Red Lodge, Montana

July 10, 1989

District Ranger
Beartooth District
Custer National Forest
Red Lodge, Montana 59068

Dear Sir:

In regards to the Ruby A Federal No. 1-9 oil/gas well, I have several things I would like to mention.

26-1 After reading the DEIS, and seeing nothing on the cumulative impact on the Beartooth Face from the seemingly endless assault from mining interests, etc., I am forced to wonder about the EIS team. I would think that all activity, current and proposed, should be considered carefully. Cumulative impact must be a factor in the decision making process of this proposal.

26-2 We must consider the implications if the project is successful(?) and oil is found. Nothing on the Face or the Plateau would be safe from exploration and exploitation. Wildlife habitat would be non-existent in many areas, as once again, our wild things take a back seat to industry and big money.

26-3 The most wondrous traits of this area are her unspoiled beauty and tremendous array of wildlife. The Forest Service must take the responsibility of protecting these irreplacable assets for generations to come.

26-4 This agency has been given the job of making responsible decisions concerning areas that belong to all Americans. In this instance, after all of the other proposals across the Face, I would hope that cumulative impact would now be a factor. The habitat is diminishing rather quickly. Our wild things deserve better.

CUSTER NATIONAL FOREST
BEARTOOTH DISTRICT

JUL 10 1989

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	Rec Tech	
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Sincerely,

Sherry Fears

Sherry Fears
Box 401
Red Lodge, MT 59068

26-1 Within the scope of the issues identified in Chapter 1, the EIS (Chapter 4) and Appendix B do discuss the cumulative impacts of the proposed project and those that could be expected under a reasonable foreseeable development scenario.

26-2 Approval of the proposed project in no way guarantees of implies that future projects will be approved, carte blanche. The EIS points out that future projects will be subjected to a NEPA analysis.

26-3 We agree. We believe the management direction outlined in the Forest Plan for Management Area C provides the overall management approach that will result in the greatest overall net public benefit.

26-4 See the response to comment 1 above.

D 2 **LETTER 27**

THE STATE OF WYOMING

MIKE SULLIVAN
GOVERNOR

1890-1990 WYOMING CENTENNIAL A LASTING LEGACY

Department of Environmental Quality

Herschler Building • 122 West 25th Street • Cheyenne, Wyoming 82002

Administration	Air Quality Division	Land Quality Division	Solid Waste Management Program	Water Quality Division
(307) 777-7937	(307) 777-7391	(307) 777-7756	(307) 777-7752	(307) 777-7781

MEMORANDUM

TO: Phil Jaquith, District Ranger

FROM: Dennis Hemmer, Director, DEQ

DATE: July 5, 1989

SUBJECT: Ruby A Federal No. 1-9 EIS Review.

The draft EIS report indicates that all drilling activities will be conducted within the State of Montana. As long as this draft report becomes final in terms of the location of the drilling sites, the Wyoming Solid Waste Program doesn't have any jurisdiction.

If the drilling sites change or Phillips decides to construct an on site disposal facility for domestic or industrial wastes within Wyoming, a permit will be required by this department.

CUSTER NATIONAL FOREST
BEAVERHEAD DISTRICT

JUL 14 1989

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Dennis Hemmer, Director
Department of Environmental Quality
State of Wyoming
Cheyenne, Wyoming

Thank you for your comments.

LETTER 28

Dr. R.A. and Trudy Ann Shunk, Fishtail, Montana

Dr. R.A. Shunk
Trudy Ann Shunk
P.O. Box 52
Fishtail, MT 59028
328-4218

July 8, 1989

Phil Jaquith
Beartooth District
Custer National Forest
Route 2, Box 3420
Red Lodge, MT 59068

Dear Phil:

Enclosed are our comments on the Ruby A Federal wildcat oil drilling program. Thank you for soliciting our comments on behalf of the SPA. If more specific details are warranted please do not hesitate to contact us.

Very truly yours,

Dr. R. A. Shunk
Trudy Ann Shunk

Encl

CUSTER NATIONAL FOREST
BEARTOOTH DISTRICT

JUL 11 1989

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LETTER 28

COMMENTS ON THE EIS FOR THE RUBY A OIL EXPLORATION PROJECT

Authors: Dr. R. A. Shunk and Trudy A. Shunk/SPA

Date: July 8, 1989

Phillips believes a potential oil reservoir exists under the west edge of the Beartooth plateau at a depth of about 6000' below sea level. The original proposal that Phillips made to reach this formation was to start drilling on top of the Beartooth Plateau in the Line Creek area. This caused such a reaction from people worried about the impact on the tundra-like terrain and the wildlife there that Phillips withdrew from that proposed site and made a new proposal for a different site. They came down the west side of the Plateau to roughly the foot of the plateau. The proposed new drill site is at an altitude of about 6500' so the proposed drill hole will go through 12,500' of overburden. Phillips states that they can set up and do everything, from road building to rig set-up and drilling down 12,500', in the time period between May 15 and Sept. 15.

Time Period for Drilling.

28-1 We beleive that the time period for operations on the elk winter range should be between June 15th and September 15th, with no option to allow some extension of that date. However, the drilling period will encompass two summers, so the use of the June to September time frame for drilling does not impose any particular hardship on anyone and is a conservative estimate of the time when the drilling will not impact the elk herd. Therefore we recommend that the letter of intent specifically should define the drilling and occupancy period for the driller and road construction crews and surveyors should be between June 15th and September 15th.

Ruby A Drill Site.

28-2 The presently proposed drill site sits on an open almost level area on the face of the moutain that must be reached by a road which will require extensive side hill cutting. The hillside is so steep in places that reclamation will be difficult. This area is one which is used by elk moving from one part of their winter range to another. As the drilling site will probably interfer with this travel, we do not think that it is worth the risk of allowing the site to be located there. It has been shown in ref 1 that such road building and site construction does impact the elk and they shun these areas even if human occupancy is removed. We recommend that the drill site be moved, either to Gold Creek or down the face of the mountain, at least to the foot of the hill from where the presently proposed site is located. This will result in no serious road construction as proposed and remove a restriction on the elk movement.

28-1 See Comment Response #14-1.

28-2 Section 4.3.3.1.1.2 of the DEIS and the reclamation plan presented in Appendix D discuss reclamation along this segment of the access route. A special road construction technique, "bench cut and end haul," would be utilized to minimize the area of disturbance and maximize the potential of successfully regrading and revegetating the disturbance. Monitoring would be utilized to ensure successful reclamation.

Full Field Development.

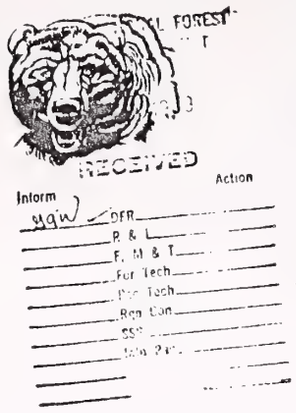
28-3 If oil is found and is economically recoverable, a full field development will be pursued. The development as currently envisaged will very probably result in the demise of the elk herd's winter range, unless the well construction sites are removed from the winter range. The proposal to develop the three specific locations and construct roads to this location will surely destroy the elk's routes to the various parts of the winter range. We recommend that full field development be subjected to a very critical review and that it not be made part of an EA. Otherwise the Forest Service can write off the elk herd on that winter range, and in fact this may become the only option.

1. "Coordinating Elk and Timber Management, Final Report of the Montana Cooperative Elk-Logging Study 1970-1985", Jan 1985, Montana Department of Fish, Wildlife and Parks, Bozeman MT.

28-3 A decision on field development is not being made at this time. The Forest Service and Bureau of Land Management did look at field development as a reasonable foreseeable development in Appendix B as we felt this information was necessary to enable the responsible officials to make a decision on the single exploratory well. We concur before a decision is made on field development, a new environmental analysis will have to be completed.

D-29

Montana Department of Fish, Wildlife & Parks



1420 East Sixth Avenue
Helena, Montana 59620
July 12, 1989

Mr. Phillip Jaquith
Beartooth Ranger District
Custer National Forest
Route 2, Box 3420
Red Lodge, MT 59068

Dear Mr. Jaquith:

The DEIS for Ruby A Federal No. 1-9 exploratory oil/gas well is a thorough analysis presented in a well written document. We commend the authors of the report and you for the process. A multi-interest task force is a progressive approach to resolve difficult environmental issues.

29-1 The Custer National Forest Plan allocated the area of the Ruby A well to "Management Area C". Given a goal to manage key wildlife habitats for optimum quality and diversity, we believe the DEIS should give greater emphasis to maintaining elk security.

29-2 Results from the Montana Cooperative Elk-Logging Study also are directly applicable to projects like the Ruby A well. The DEIS referenced that report and should incorporate its recommendations. The proposed Ruby Creek Site is of concern because it occurs in a saddle that also is a major elk crossing. The elk-logging study recommended against road construction in saddles and low divides to avoid negative influence on elk. Selection of the alternative site in Gold Creek would be appropriate mitigation.

29-3 The DEIS defined an operating window of June 15 - November 15 during years of normal climatological events, with a provision for early termination in the event of drought or heavy snow. This may not prevent displacement of elk from transitional, rutting and winter habitats because an early termination during active drilling would be difficult to implement. A window from June 15 - September 15 would be more appropriate. During normal years, the window could be extended to October 15. Criteria to define "normal climatological events" should be specified.

Archery hunters will be in the project area during drilling. Measures to ensure their safety in case of an H_2S blowout should be required.

Ron Marcoux, Deputy Director
Montana Department of Fish, Wildlife & Parks
Helena, Montana

29-1 Key wildlife habitats for elk on this area consist of fall, winter, and calving ranges. Mitigation measures developed in coordination with the Montana Department of Fish, Wildlife, and Parks were designed to protect these key habitats and prevent significant impacts during both normal and abnormal weather conditions. See Section 5.3.6.

29-2 Mitigation measures developed in coordination with the Montana Department of Fish, Wildlife, and Parks were designed to protect elk movement corridors during the seasons which they are in use (fall, winter, and spring). The provisions for limiting drilling operations described in paragraph #1 of Section 5.3.6 will minimize the probability of displacing elk from the Ruby A site and reduce any potential impacts to non-significant levels.

29-3 The mitigation in paragraph #1 of Section 5.3.6 specifically leaves the determination, of whether or not the continuation of drilling beyond September 15 will have a significant negative impact on elk, up to the people most qualified to make such a year to year judgement: namely, the FS in consultation with MDFWP biologists. It is the responsibility of these local experts to judge whether or not climatological conditions prevailing during a given year merit early shut-down.

The perception that terminating an active drilling operation will be difficult to implement does not mean that it cannot or will not be done. The FS can and will execute its designated administrative responsibilities as set forth in Section 5.3.6, including the termination of drilling operations when called for.

29-4

Discussion of the probable field development scenario enhanced the value of the document. If field development proceeds, it will be difficult to accomplish the goal for Management Area C. Doing so will require careful monitoring and evaluation and mitigation activities tiered to levels of petroleum production. The need for monitoring, evaluation, mitigation and accomplishment of those purposes in close coordination with the department should be stipulated.

To preclude the conditioning of elk to avoid fall ranges, activity should be limited to one pad site after September 15. Further, two different wells should not be drilled from the same pad site during two consecutive years.

Thank you for including Shawn Stewart in the task force, for your diligence with this project, and our opportunity for comment.

Sincerely,

Ron Marcoux

Ron Marcoux
Deputy Director

cc: Roger Fliger

JM
626.2a

29-4 The decision being made based on the analysis disclosed in the FEIS is for a single exploratory well. Should the drilling of this well result in the potential for production, an additional analysis would be completed to address production and associated field development. The Forest Service agrees with your comment, and should this analysis become necessary, the need for specific mitigation measures, monitoring and evaluation, and coordination would be addressed in that document.

D-30

DEPARTMENT OF HEALTH & HUMAN SERVICES Public Health Service

LETTER 30

Centers for Disease Control
Atlanta GA 30333

July 7, 1989

Phil Jaquith
District Ranger
Beartooth Ranger District
Custer National Forest
P.O. Box 3420
Red Lodge, Montana 59068

Dear Mr. Jaquith:

We are providing comments on the Draft Environmental Impact Statement (DEIS) for the Ruby A Federal No. 1-9, Exploratory Oil/Gas Well. We are responding on behalf of the U.S. Public Health Service. We commend the Forest Service and Bureau of Land Management for preparing this DEIS to fully explore impacts of a proposed oil well in an environmentally sensitive National Forest area. As stated in the DEIS, this process will insure that the final decision is informed and based upon relevant factors which will result in enforceable mitigation measures through the Record of Decision (ROD).

30-1 We limited our review to impacts on public safety and health. This review was facilitated by the availability of specific sections in the DEIS entitled "Heath and Safety." While these sections were rather brief, they did indicate specific consideration of the serious potential health hazard of inadvertent hydrogen sulfide releases. Due to the number of well documented oil field accidents involving hydrogen sulfide, we recommend the development of detailed written procedures to minimize the likelihood of accidental releases.

The less severe potential impacts on public health and safety include air quality, vehicular travel on graveled and unimproved roads, and low probability events such as floods, or landslides. We were pleased to find that the potential impacts in these areas are minimal and that general safety hazards are recognized with adequate proposed mitigation for minimizing those hazards.

Thank you for sending this document for our review. Please insure that we are included on your mailing list for the FEIS for this project as well as future documents with potential public health impacts which are developed under the National Environmental Policy Act (NEPA).

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Sincerely yours,

David E. Clapp, Ph.D., P.E., CIH
Environmental Health Scientist
Center for Environmental Health
and Injury Control

David E. Clapp, Environmental Health Scientist
Center for Environmental Health and Injury Control
Department of Health & Human Services
Centers for Disease Control
Atlanta, Georgia

30-1 A detailed Contingency and Evaluation Plan has been prepared by Phillips Petroleum Company. This plan discusses methods used to prevent H_2S release and procedures which will be implemented in case of accidental H_2S release. This plan has been reviewed by qualified BLM personnel and will require approval before drilling can commence.

D-31

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1860 Lincoln Street, Suite 404 • Denver, Colorado 80295
303/860-0099

July 7, 1989

Mr. Phil Jacquith
District Ranger
Beartooth Ranger District
Custer National Forest
P. O. Box 3420
Red Lodge, MT 59068

Dear Mr. Jacquith:

31-1 On behalf of the Rocky Mountain Oil & Gas Association (RMOGA), I offer the following comments on the Draft Environmental Impact Statement (EIS) for Phillips Petroleum Company's Ruby-A Federal No. 1-9 Exploratory Oil and Gas Well. As you know, RMOGA is a trade association whose members account for more than 90% of the oil and gas exploration, production and transportation activities in the Rocky Mountain West. As such, we are extremely concerned that the Forest Service chose to delay the proposed drilling project in order to placate selected members of the public with the preparation of excessive environmental documentation on this single exploratory well. We point out that the Ruby Well will not be the first well drilled in this area. A previous well was drilled by Amoco, which was approved with an environmental assessment as documentation.

The original public opposition to the Ruby Well was due to its initial location on Line Creek Plateau. Consequently, Phillips selected an alternate drilling location which would provide access through directional drilling. Once this change in location was made, public outcry virtually ceased. In fact, there is significant local support for the new well location as well as support from groups such as the National Audubon Society.

31-2 According to the DEIS, no significant impacts would occur as a result of the proposed project on air quality, transportation, soils, water, vegetation, timber, range, wildlife, cultural resources, or health and safety, due in part to mitigation measures which have been prescribed. However, it is likely that impact would have been minimal even under standard lease terms. The only impacts identified are very minor and short-term, and therefore not significant. The issues, concerns and mitigation measures discussed in the DEIS could have been just as thoroughly addressed and analyzed in an environmental assessment. An EA would have eliminated the protracted delay of project implementation caused by the preparation of a politically-inspired, and costly (both in terms of time and money, particularly to Phillips) environmental impact statement.

Alice Frell Benitez, Public Lands Director
Rocky Mountain Oil & Gas Association
Denver, Colorado

31-1 The Forest Service chose to complete an EIS to analyze the potential effects of the proposed Phillips project in accordance with the requirement of NEPA, and not to placate selected members of the public. As initially proposed, the Forest Service as well as the public at large believed there were significant issues requiring an EIS. The Forest Service does not believe there is a strong analogy between the issues of the Amoco site and the Phillips proposal.

31-2 Comment noted. Thank you for your comment.

July 7, 1989

Mr. Phil Jacquith
District Ranger, Beartooth Ranger District
Custer National Forest

page two

31-3 Furthermore, much of the mitigation required in the DEIS appears unnecessary. For example, the Forest Service has indicated that in order to limit possible adverse impacts on the elk population, Phillips will have to cease drilling by October 15. However, it is our understanding that current biological studies have indicated that drilling could continue up to November 15 without any harm to the elk. In addition, it seems as if the public's fear of drilling in areas where H_2S may be found is being used as a means to shut down drilling before the hunting season begins, despite the fact that the company will employ proven techniques to minimize any risks associated with drilling where H_2S is involved, to protect its own personnel as well as people who may be in the area.

31-4 We question why the Forest Service required Phillips to fully document and analyze two separate erosion reclamation plans when such analysis should have been limited to the proposed action. We are certain that less time and money would have been spent if the Forest Service were responsible for preparing this documentation, because the Forest Service is accountable for the money it spends. It hardly seems ethical for the Forest Service to take advantage of industry by requesting that excessive analyses be prepared: for example, the requirement for Phillips to prepare recreation studies for broad areas, when its project involves only one drainage.

31-5 We sincerely hope that the approach utilized by the Custer National Forest to analyze a relatively minor exploration well, especially one which is being directionally drilled to minimize or avoid conflicts, will not become commonplace in Region 1. While we agree that the public should have a voice in how federal lands are managed and used, public opposition by one or two groups should not give the Forest Service license to require the preparation of superfluous documentation in the name of public disclosure and involvement. It is important that unnecessary delays in project approval, such as the delays Phillips has experienced on this project, be avoided in the future. In addition, we hope that future well proposals on the Custer National Forest, or in Region 1, will not be subject to the same excessive mitigation measures which are being required of Phillips in order for the company to drill its well. The Forest Service is responsible for developing reasonable mitigation requirements and for keeping delays to a minimum.

We appreciate this opportunity to comment.

Sincerely,

Alice Frell Benitez

Alice Frell Benitez
Public Lands Director

AFB:cw
c.c. John Mumma, Regional Forester, Region 1

31-3 There are several major concerns with extending the drilling period past October 15 such as impacts to recreationists (hunting), impacts to elk if abnormal weather conditions such as early snows occur, and the potential for resource damage to occur if the well rig should have to be dismantled and moved in extremely wet conditions.

31-4 Since the project has not been permitted as this time, the erosion control, revegetation, and rehabilitation plan presented in the DEIS, by necessity describes and analyzes the reclamation needed at both alternative drill sites and access route variations. The Forest Service has not requested or required Phillips Petroleum do complete excessive analyses for broad areas. We believe the analysis for recreation is commensurate with NEPA direction and necessary to assess direct, indirect, and cumulative impacts.

31-5 Comment noted. As in the past, future projects will be subject to the level of environmental analysis commensurate with the public and environmental issues, and the potential for significant effects to the human environment.

LETTER 32

File Phillips Comment DEIS

D-32

RUBY "A" FEDERAL NO. 1-9
EXPLORATORY OIL-GAS WELL

DEAR READER:

The Draft Environmental Impact Statement (DEIS) presents the facts and discloses the analysis of the environmental effects of Phillips Petroleum Company proposal to drill an exploratory oil-gas well.

A lot of time and expense has gone into this little book. To many readers it is complicated and I think it is over done. The size of this project does not need a volume of this magnitude.

We need to find new oil and gas reserves. It has been stated that in Carbon County 30 to 35 percent of the taxable value is oil and gas.

Hunting in District 520 in 1988 Sixty nine Elk were taken out of 195 elk permits issued. This covers a lot of acres. Remember Phillips well would be only 1.7 acres for the location and only 0.3 miles of new access roads.

Now they need to drill this Exploratory Well and if it is capable of finding Hydrocarbons, then that is the time to look into the aspects of Field Development.

Sincerely,

Tom Croft

Tom Croft

Tom Croft

Thank you for your comments.

Box 2064 D-19
Roberts, Mt. 59070
July 7, 1989

CUSTER NATIONAL FOREST
BEARTOOTH RANGER DISTRICT

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Phil Jaquith
District Ranger
Beartooth Ranger District
Custer National Forest
P. O. Box 3420
Red Lodge, Montana 59068
Dear Phil:

I have hiked the Line Creek Plateau and Gold Creek areas. The natural beauty of these areas is a very important resource. No amount of tax dollars can ever compensate for the loss of solitude and awesome beauty. Line Creek Plateau was included as an area designated for further study in the Montana Wilderness Bill.

33-1

Carbon County should encourage recreational use of our lovely lands and not surrender to a degradation of our most important resource.

It amazes me that oil leases were ever allowed in this area. I urge a

Frances Main, Roberts, Montana

33-1 The location of the proposal of Phillips Petroleum Company was changed due to environmental considerations of the fragile ecosystems associated on top of the Line Creek Plateau, and Phillips' reevaluation of seismic data caused a shift in the perceived location of the target geologic structure, thereby making a directional drilling attempt physically possible. The current location is below the rim of the Plateau.

See Comment Response #2-1.

No-Action Unconstrained decision. Unless the oil companies are out to gouge the public the bare conciliation should not be a huge financial burden on the public.

The opportunity to refresh oneself at these sites is very precious. To take this opportunity from this generation and future generations for a short range economic gain is unthinkable.

Sincerely,
Frances Main

D-34

United States Department of the Interior
NATIONAL PARK SERVICE
YELLOWSTONE NATIONAL PARK
WYOMING 82190

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:
L7619(YELL)

JUL 2 0 1989

Mr. Phillip H. Jaquith
Beartooth Ranger District
Custer National Forest
Route 2, Box 3420
Red Lodge, Montana 59068

Dear Mr. Jaquith:

We appreciate the opportunity to comment on the Draft Environmental Impact Statement for Philips Petroleum Company's proposal to drill an exploratory oil and gas well on the east face of the Line Creek Plateau. Obviously, this proposal is a considerable distance from Yellowstone National Park resources. We agree that transportation, soil, and water effects are mostly localized and do not significantly affect park resources. However, we do offer a few comments on how potential development could affect ecosystem resources.

34-1 Most importantly, we see no mention of grizzly bears in the document. While we recognize that sightings are rare on the Custer National Forest, our bear management staff is aware that they do occur. Although the drill site is located outside designated "Management Situation" lands, we believe some mention should be made of the potential for grizzlies to occur outside such zones. We suggest, due to the high level of public concern and the threatened nature of the ecosystem's grizzly bear population, that potential concerns (i.e., roadkills, displacement, habitat disturbance) be monitored and addressed in the planning process.

Yellowstone National Park continually monitors the ambient air quality of its Class I airshed, and we are pleased that on-site monitoring is addressed in the EIS. With respect to both air quality concerns and socioeconomic concerns, the impacts could vary greatly with full field development. Therefore, we hope that if additional drilling proposals emerge, the cumulative effects of full field development are addressed in one document.

As our agencies increase efforts to coordinate management activities in the Greater Yellowstone area, we stress the need to recognize that large-scale mineral development in the area be considered in light of the highly unique values associated with the nearby park and wilderness areas.

Sincerely,

for Robert D. Barbee
Superintendent

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United States Department of the Interior
National Park Service
Yellowstone National Park, Wyoming

34-1 Impacts to grizzlies were not discussed because no classified grizzly bear habitat occurs within 10 miles of the project area, no grizzly sightings have ever been reported for the project area, and according to grizzly bear authorities, the potential for bears to occur there is very low. See Section 3.6.1, paragraph 5 in the FEIS.

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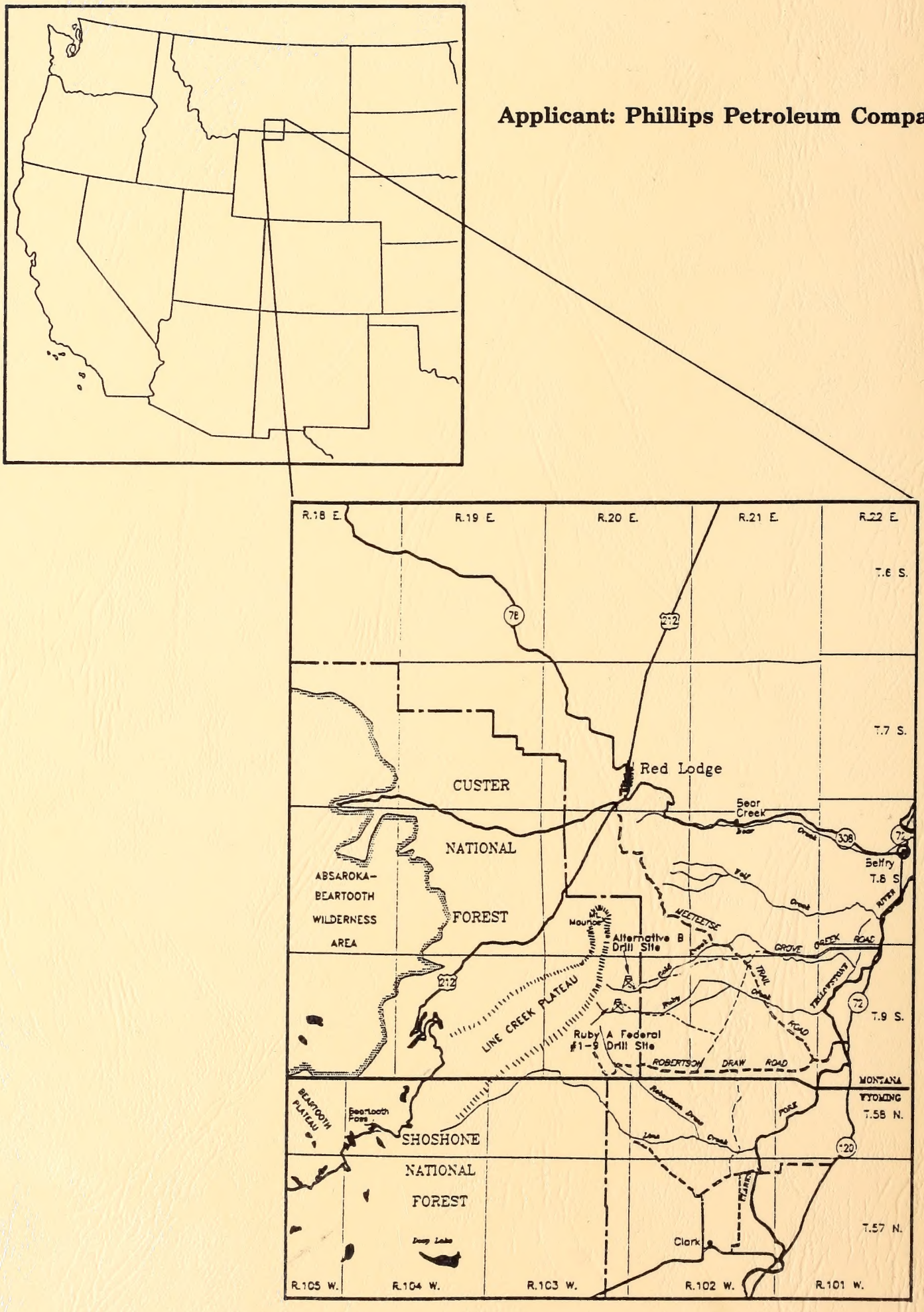
Applicant: Phillips Petroleum Company